Wildlife Resources Technical Report

Wyoming Pipeline Corridor Initiative Area

Prepared for:

Wyoming Pipeline Authority

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March 2016

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Wildlife

This technical report was prepared in support of the Programmatic Environmental Impact Statement (PEIS) for the Wyoming Pipeline Corridor Initiative (WPCI). This technical report describes wildlife resources present within the proposed WPCI corridors and evaluates these general characteristics as related to potential or known impacts on the resources from the proposed project.

This programmatic evaluation was designed to aid in the development of a long-term vision for the WPCI that includes corridor-wide concepts and assists in making informed decisions about the best practices and strategies for near- and long-term implementation. As such, this PEIS defines existing and future potential issues within the proposed corridors, identifies a range of practices and strategies relevant to those issues, and evaluates the potential impacts of the Project on wildlife and wildlife resource at a broad-scale level.

The objectives of this report are: a) to characterize the proposed WPCI at the landscape and regional levels, describing the wildlife resources present within and around the proposed corridors; b) to evaluate the proposed corridors based on vegetation characteristics, assessing potential risks to wildlife and habitats, and c) to address implications for future pipeline project development, making recommendations for avoidance, minimization, and mitigation measures.

This programmatic analysis examines potential impacts at a conceptual level while subsequent NEPA documents for individual projects will include site-specific quantitative analyses of effects and provide avoidance, minimization, and mitigation measures. Individual projects will be required to follow all specifications stated in the Plan of Development (POD) and implement them on all lands affected by construction within the proposed corridors unless otherwise specified by the landowner or land management agency.

Wildlife resources were evaluated through a desktop search of existing data; available datasets used to identify biological resources within the proposed corridors included topographical and aerial maps, land use/land cover or gap data, elevation data, data publicly available from several state, federal, and non-governmental agencies, published literature, and field guides. Information about presence (potential or verified) and location of species was obtained from publicly available information on several websites, including the United States Fish and Wildlife Service (USFWS), the Wyoming Game and Fish Department (WYGFD) and the Wyoming Natural Diversity Database.

Affected Environment-Wildlife Resources

The WPCI proposed corridors for this programmatic analysis encompasses 4,683,391 acres (1,895,301 hectares) of central and western Wyoming and crosses three Level III Ecoregions including the Wyoming Basin, Northern Great Plains, and a small portion of the Southern Rockies ecoregions. Each ecoregion is characterized by unique terrain and vegetation which influence what resources are available for wildlife and which species of wildlife occupy, even seasonally,

these areas. As such, the WPCI corridors consist of diverse plant communities, wildlife habitat, and wildlife species. The vegetation characteristics (See Vegetation Technical Report) of each plant community are the most important factor for determining likelihood of species presence. The vegetation communities and habitat types identified (See Vegetation Technical Report) within the proposed corridors provide suitable resources and habitat for a variety of common wildlife species in Wyoming (**Table** 1).

Table 1. Vegetation Communities and State Wildlife Action Plan Terrestrial Habitat Types Intersected by the Wyoming Pipeline Corridor Initiative with Representative Wildlife Species.

Vegetation Community	SWAP Habitat Type	Description	Representative Wildlife Species
Shrub/Scrub	Sagebrush shrublands	Natural Vegetation is mostly sagebrush steppe, with the eastern edge of the region having more mixed grass prairie. Cheatgrass usually replaces native perennial grasses in over-grazed sagebrush plant communities. European annual grasses have replaced the sagebrush vegetation in areas affected by frequent fires. Livestock ranches are common. Rangeland provides wildlife habitat for several species. Scattered oil, gas, and coal deposits.	Wyoming sagebrush obligate wildlife species include Sage sparrow, Brewer's sparrow, sage thrasher, sage-grouse, pygmy rabbit, sagebrush vole, and sagebrush lizard. Additional species commonly found in sagebrush shrublands include, elk, mule deer, pronghorn, black-tailed jackrabbits, swift fox, and mountain plover.
	Desert shrublands	Vegetation is a sparse cover of arid lands shrubs, with composition and density gradients determined by moisture, salinity, and topography. Generally occurs at lower to middle elevations and at many locations intergrades with a number of other arid and semiarid plant communities such as desert grassland and sagebrush steppe. This arid landscape is very sensitive to grazing pressure which may promote the invasion of weeds such as Russian thistle, cheatgrass, and the toxic halogeton. Oil, bentonite, and coal deposits are extensive throughout the basin.	Desert shrublands support game species like mourning dove, sage-grouse, desert cottontail rabbits, mountain cottontail rabbits, pronghorn antelope, mule deer. Other species found in desert shrublands include white-tailed jack rabbit, bushy-tailed woodrat, coyotes, bobcats, badgers, great horned owls, golden eagle, Swainson's hawk, red-tailed hawk, prairie falcons and Wyoming pocket gopher

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Vegetation Community	SWAP Habitat Type	Description	Representative Wildlife Species
Herbaceous/ Grasslands	Prairie grasslands	Characterized by natural disturbances. Located in eastern Wyoming and in basins of central and western Wyoming. Perennial grasses, sedges, and herbaceous forbs dominate. Livestock grazing is common. Many invaded by the noxious and invasive plant that occur in agricultural lands.	Prairie grasslands are inhabited by some of the West's iconic species including the pronghorn antelope and meadow lark, Wyoming's State bird. Common birds of the prairie grasslands includes the prairie sharp-tailed grouse, rough-legged hawk, hoary redpoll, Lapland longspur, snow bunting and wintering avian species like snowy owls, and gyrfalcons. Prairie dogs are prolific in the grasslands and their large colonies provide habitat for burrowing owls, black-footed ferrets, long-tailed weasels, mountain plover and swift fox. Prairie dogs also supply a consistent prey base for predators like ferruginous hawks, and golden eagles.
Mixed forest	Xeric/Lower montane forest	Scattered dry mountain ranges and foothill slopes. Small forested areas occur at higher elevation. Land use is mostly livestock grazing and wildlife habitat.	Stands of juniper provide important wintering habitat for mule deer and elk, while species like yellow-bellied racers utilize juniper's wind blocking and ground heat capturing shape as thermal cover in the winter. Over 100 bird species have been documented nesting, perching and singing from junipers in Wyoming. Ponderosa pine communities provide habitat for elk, mule deer, white-tailed deer, black bear, wild turkeys, blue grouse, rough grouse, and black backed woodpeckers.

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Vegetation Community	SWAP Habitat Type	Description	Representative Wildlife Species
Deciduous forest	Aspen/ Deciduous forest	Aspen, bur oak, Gambel oak, or bigtooth maple are dominant species. Varies in type from grasses and grasslike plants to shrubs, deciduous trees, and conifer trees depending on climate, terrain, soils, streams size and disturbances. Associated with river channels, lake shores, hummocks, and wetland edges. Provides important wildlife habitat.	Aspen stands commonly support grass and forb production and provide important foraging resources for elk, mule deer, moose, black bear, blue grouse, chipmunks, and snowshoe hares. Aspen stands support large numbers of invertebrates which are important foraging sites for bats, shrews, and insectivorous birds. Beavers and Northern pocket gophers are also commonly found in aspen stands. Acorns from oaks trees provide forage for deer, elk, wild turkey, black bear and a variety of squirrels.
Evergreen forest	Montane and Subalpine forest	Generally at elevation greater than 7,000 feet, with vegetation gradients determined by snow accumulation, aspect, soil type, temperature and evapotranspiration rates along an elevation gradient. Used mostly for timber, recreation, and wildlife.	Subalpine forest provide habitat for forest carnivores like, American marten, wolverine, Canada lynx, and fisher. These forest support wood digesting invertebrates and fugii which represent critical food resources for southern red-backed vole, red squirrels, and northern flying squirrels. Whitebark pine seeds are an important food sources for black bears, ground squirrels, chipmunks, woodpeckers, nuthatches, and ravens. Spruce-fir forests provide valuable thermal cover for mule deer elk, moose, and snowshoe hare.

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Vegetation Community	SWAP Habitat Type	Description	Representative Wildlife Species
Herbaceous/ Woody wetlands	Wetlands/ Riparian	Wet plant communities on soils that are seasonally covered with water or in associated with riverine systems. Located in areas of high drainage beneath surrounding mountain ranges, or in areas with high water tables that keep the soils moist much of the year. Includes floodplains, low terraces, alluvial fans, riparian wetlands, wet meadow, potholes, playas, and marshes. Man-made irrigation projects have increased the areal extent of this vegetation type.	Wetlands provide invaluable habitat for Wyoming waterfowl such as, mallards, pintail, American widgeon, gadwall, and several teal species, and goose species. Migrating shore birds like the American avocet, killdeer, common snipe, western sandpiper, long-billed curlew and white-face ibis also find Wyoming's wetlands indispensable. Native amphibians like the plains leopard frog and barred tiger salamander depend on open water to survive while reptiles like the northern rubber boa prefer the wet environments riparian areas and wetlands provide.
Cropland and Pasture	Excluded	The majority of crops are irrigated. Agricultural land can harbor populations of noxious and invasive plants. Pastures are used by livestock for forage.	Pasture grass lands and agricultural crops can make up a significant percentage of mule deer, white-tailed deer and even elk diets depending on the crop and availability of natural forage. Small mammal like black-tailed jackrabbits, mountain cottontails, plains pocket gophers, meadow voles, and deer mouse can take advantage of these man-made plant communities. Predator species such as coyotes, red fox, badgers, red tailed hawks and great horned owls are also likely in these areas.

Source: Wyoming Interagency Spatial Database & Online Management (WISDOM) System

A complete list of wildlife species with the potential to occur within the WPCI proposed corridors is included in Appendix A. Given the extensive list, the lack of status and knowledge gaps on distribution and habitat requirements of several species, and the potential for occurrence in the counties intersected by the WPCI proposed corridors, further investigation into wildlife species and their habitats may be warranted as more defined locations for individual projects are determined within the proposed corridors.

Environmental Consequences - Wildlife Impacts and Mitigation

Wildlife and wildlife resources within the proposed corridors would be primarily affected by cutting, clearing, topsoil removal and grading activities associated with pipeline construction. The magnitude of the impact would depend on several factors including the type and amount of vegetative cover affected during construction and the frequency and type of vegetation recovery plans and restoration practices implemented on the right-of-way (ROW) during pipeline operation. In general, disturbances associated with construction activities would be minimal because they would be limited to specific approved areas (WPCI POD). The degree and duration of construction-related impacts would vary between wildlife species; impacts on plant communities during operation would vary depending on the nature of specific projects, the amount of above ground structures, the frequency of surface travel along the ROW, and the implementation of restoration plans, among other factors.

Oil and gas development, including pipeline construction, causes a range of effects on wildlife and wildlife resources. Excavations, roads, above ground facilities and equipment, human activity, noise, and changes to water resources physically change or eliminate vegetative cover from future use, reduce the quality of remaining plant communities, or result in a situation that non-native or invasive species may degrade or outcompete the native species. Pipeline construction within the WPCI would have direct, indirect, temporary and permanent impacts on wildlife and wildlife resources.

The final WPCI would cross approximately 1,984 miles of wildlife habitat. Wyoming Pipeline Authority has estimated a total area needed for the final proposed corridor, ranging in width from 200 feet to 300 (WPCI POD Appendix B) to be approximately 58,138 acres; however, for this programmatic analysis, a proposed corridor width of two mile was reviewed to include an area of approximately 4,683,392 acres (proposed corridors). Future analysis would be required to narrow the scope of inquiry to the final determined 200-300 feet wide corridor location to identify specific impacts.

The majority of the two-mile wide corridor analyzed for this programmatic evaluation is located within shrub/scrub (68 %) and herbaceous/grasslands (26%) vegetation cover (Table 1 of Vegetation Technical Report). The proposed corridors cross nearly 3.2 million acres of shrub/scrub cover and approximately 1.2 million acres of herbaceous/grasslands. Barren lands and agricultural hay fields/pastures represent another possible two percent of total disturbances, or approximately 45,000 acres and 44,000 acres respectfully. Remaining vegetative land cover types included in the proposed corridors are discussed in detail in the Vegetation Resources Technical Report.

Construction of future projects within the proposed corridors may alter the original landscape so that wildlife habitat use patterns are affected, possibly displacing some wildlife from a portion of the proposed WCPI area. The proposed corridors cross significant areas categorized as grasslands (Vegetation Technical Report Table 1), representing potential habitat for grassland obligate species and species sensitive to fragmentation. The extensive amounts grassland complexes provide suitable habitat for several grassland-adapted species which might be

displaced or negatively affected by habitat fragmentation. Approximately 40% of the original shrubland extension in North America has been converted to agricultural or developed lands (Connelly et al. 2004) and the vast majority of what remains has been heavily modified. Sagebrush shrub-steppe, or prairie that has a strong sagebrush component, occurs scattered throughout the mixed- and short-grass prairie landscape of western North America (Hagen et al. 2005). Wildlife associations with shrub-steppe communities include several birds, mammals, and reptiles of concern for the state (WGFD 2010a). These results, coupled with the substantial native habitat blocks of shrubland with various degrees of interspersed grasses indicate that areas of native grassland and shrub-steppe plant communities that are currently in good condition should be avoided to the extent practicable to minimize impacts and maintain their integrity.

Wildlife in general would be subject to the incremental loss of habitat and increased habitat fragmentation until restoration has been completed and native vegetation is reestablished. Waterfowl could be temporarily disturbed during construction across certain wetlands and in the vicinity of water bodies. Direct impacts could include nest or burrow destruction, abandonment, loss of eggs or young, or death. Indirect impacts could include the temporary displacement of wildlife as a result of increased noise and human presence. Vehicle and equipment emissions and fugitive dust may also displace wildlife. There may be a shift in the movement of some individuals as a result of construction activities and disturbances that could increase collisions with vehicles along local roads. Such impacts would be temporary and animals would likely return to their home range within the WPCI Project area following construction.

Construction

Construction of the final WPCI Project would disturb approximately 58,138 acres (WPCI POD Appendix B) of vegetative cover and wildlife habitat. The overwhelming majority of the pipeline project disturbances would be temporary with pipelines buried within the 200-300 feet corridor. According to the Restoration and Revegetation Plan (WPCI POD Appendix F), restoration of the pipeline corridor would be initiated as soon as 14 days after trenches are closed within a construction segment. Individual pipeline project proponents would be required to re-contour, restore, and revegetate the corridor in accordance with the Upland Erosion Control, Revegetation, and Maintenance Plan (WPCI POD Appendix E), the Restoration and Revegetation Plan (WPCI POD Appendix F), and the conditions of any permit required by local, state, or federal regulatory agency with jurisdiction over individual pipeline installation projects. Land that is used for aboveground facilities, such as block valves, pigging equipment, or pump and compressor stations, would be considered a permanent loss as new infrastructure would be fenced off and in some instances, the ground surfaces covered in gravel (WPCI Plan of Development). The exact number, area needed, and location of such infrastructure would be determined during the design of individual projects. Above infrastructure would result in permeant loss of wildlife habitat. Existing roads are anticipated to be used to access the corridor where available. The WPCI has been designed to follow approved corridors on federally managed lands therefore it is anticipated that new roads would not need to be constructed on federal lands (WPCI Plan of Development). New road construction may be necessary on state and private lands, however: private and state lands only account for 42% of the proposed lands crosses for the project (WPCI POD Table 1).

The impact of the individual pipeline projects on wildlife species and their habitats would vary depending on the habitat requirements of each species and the existing habitat present along the pipeline corridor. Direct impacts from construction would include the displacement of wildlife along the pipeline right-of-way and access roads and possible direct mortality of some individuals. Larger or more mobile wildlife, such as birds and large mammals, would likely flee the vicinity of the right-of-way as construction activities approach. Construction would potentially disrupt bird territory selection, courting or nesting and wildlife breeding behaviors on and adjacent to the right-of-way, depending upon the season in which construction occurs. It is anticipated that much of this wildlife would relocate into similar plant communities and environments nearby; however, if there were a lack of adequate habitat, inter- and intra-specific competition and lower reproductive success and survival may result.

The influx and increased density of animals in nearby undisturbed areas could also reduce the reproductive success of animals that are not displaced by construction, and increase the risk of predation in the area. Additionally, less mobile wildlife, such as some fossorial mammals, reptiles and amphibians could be crushed by construction equipment or trapped in trenches. These effects would diminish after construction, and wildlife could return to the newly disturbed areas and adjacent, undisturbed areas after right-of-way restoration is completed and access roads are restored or their use is no longer required. Wildlife populations would return to preconstruction levels previous to development only if suitable plant communities are restored.

The cutting, clearing, and/or removal of existing vegetation would also affect wildlife by reducing the amount of available cover, nesting, and foraging habitat. The degree of impact would depend on the type of habitat affected and the rate at which vegetation regenerates after construction. The impact on species that commonly inhabit agricultural land would be relatively minor and temporary because these areas are regularly disturbed and would be replanted during the next growing season. Herbaceous plant communities would be restored to a structural condition similar to preconstruction in a relatively short time (*i.e.*, 3 to 5 years). This would be facilitated by following the guidance set forth in the Upland Erosion Control, Revegetation, and Maintenance Plan (WPCI POD Appendix E) and the Restoration and Revegetation Plan (WPCI POD Appendix F). The effect to forest-dwelling wildlife species would be greater because forest communities would take a comparatively longer time to regenerate and likely would be prevented from reestablishing on the permanent 50-foot-wide pipeline right-of-way. The impacts on shrub-dwelling species would be comparable to impacts on forest dwelling species due to the significant regeneration timeframes of these plant communities. Such forest and shrub communities may take 50 years or longer to regenerate, depending on site-specific conditions such as rainfall, elevation, grazing, and weed introduction. However, shrubs within the permanent 200-300-foot-wide right-of-way corridor in sagebrush communities would not be revegetated. Although the structural component of shrub-dominated vegetative cover would recover slowly, successful restoration of non-woody vegetation may improve the forage value for some wildlife species within a relatively short time.

Operation

Artificial light at compressor stations could have adverse effects to wildlife. Artificial light is known to affect wildlife movement, but not all species respond to light in the same way. Some animals avoid lighted areas at night, while others congregate near lighted areas. Artificial lights have been shown to impact foraging, migration, communication, and reproductive behaviors of various

species. A noteworthy impact of artificial light is its effect on migrating birds. Bright lights are known to disorient some migrating birds and interfere with the birds' internal magnetic compasses. Once distracted by artificial light, birds may be reluctant to fly out of the lighted area and often continue to circle in the light beam until they are no longer able to continue with their migration.

Possible impacts associated with the operation of pipelines within the corridor include unauthorized releases (spills), additional human activity in the area and noise from above ground equipment. Spills from the pipeline would likely be underground and at least 30 inches below the surface. The primary product to be conveyed within pipeline buried in the corridor is CO2. Leaks of CO2 are not anticipated to impact wildlife. Surface leaks at above ground infrastructure may include pipeline cleaning or inspection fluids but would be limited in their amounts. Block valves and pump and compressor stations are expected to fenced to inhibit wildlife access to possible leaks. Pigging launch and catching facility are also possible locations for leaks. Depending on the size of the pigging facilities, the pigging equipment may also be fenced and graveled. Pigging leaks are most likely to occur during pigging/cleaning operations; however, pipeline operators would have contractors on-site during operations and would follow approved standard operating procedures minimize unauthorized releases. Spills or leaks from vehicles or equipment during field operations or maintenance activities would need to be addressed by individual pipeline project proponents within individual Spill Prevention, Control and Countermeasure (SPCC) plans specific to the material they foresee being present in the field.

The cutting, clearing, and/or removal of existing vegetation as required for safe and efficient operation of the pipeline would also affect wildlife by reducing the amount of available cover, nesting, and foraging habitat. The degree of impact would depend on the type of vegetation affected and the rate at which vegetation regenerates after construction and would be similar to impacts associated with vegetation clearing as describe above under the Construction heading.

Habitat Fragmentation and Edge Effect

Habitat fragmentation is frequently a concern when clearing and maintaining rights-of-way. In general, fragmentation could result in an altered wildlife community as species more adaptable to edge vegetative structure establish themselves, while species requiring undisturbed contiguous plant communities may be subjected to relocating or the negative effects of predation, parasitism, or inter-specific competition. Stable microclimatic conditions are essential for some amphibian species. Fragmentation may affect woodland amphibians by decreasing the amount of cover, prompting changes in ground moisture, and increasing potential exposure to the sun. Increased edge may result in increases in nest predation and lower nesting success for some bird species. Habitat fragmentation has already occurred in many areas of the proposed corridors from existing highways, roads, and utility corridors as well as fires and agricultural operations. Positive effects also have the potential to occur as a result of the proposed corridor. Deer, moose, and elk have been documented to use available browsing areas within corridors or on edges of corridors (Hartley *et al.,* 1984; Brusnyk and Westworth, 1985). Increased diversity and relative abundance of bird species, increased access to a variety of food resources, and increased ground cover, which would favor ground-nesting species (Rosenberg and Raphael, 1986) can also result for corridor construction. The close proximity of cover and forage areas at forest edges provides ideal

habitat for many game species. Higher levels of flower and fruit production, pollinator, and frugivore abundance and seed dispersal are often found along the edges (Kroodsma, 1984).

Individual projects within the proposed corridors are likely to fragment the habitat, creating edges with consequences for many ecological processes (including seed dispersal, predation rates, and movement of organisms) and influencing material and energy flow across the landscape (Cadenasso et al. 2003). Soft (low contrast) edges are generally considered better for wildlife, while hard (high contrast) edges are considered to decrease habitat suitability for many species. The creation of hard edges should be avoided to the extent possible by removing shrubs and saplings in such a way that transitional changes from one habitat type to another can be created.

To minimize fragmentation impacts on wildlife, individual pipeline project proponents may clear vegetation along the corridor in an irregular pattern to reduce the creation of hard edges or, if possible, may create or leave intact shrub patches within the pipeline corridor if agreed to by landowners and land-managing agencies. Individual pipeline project proponents can plant shrubs and trees in appropriate locations within the pipeline corridor to reduce fragmentation effects of abrupt edge created by construction and operation practices. Additionally, some large shrubs and trees removed during clearing operations can be used to construct wildlife shelters, such as brush piles, that may be used by small mammals, birds and reptiles (NRCS 2009 New Hampshire Conservation Practice Job Sheet 645 (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1081685.pdf) accessed 12/29/2015.). These shelters would be constructed after reseeding and revegetation has been initiated as a wildlife habitat enhancement measure.

Noise

Noise could potentially impact wildlife during clearing and grading of the right-of-way, during pipeline construction and during right-of-way cleanup and restoration. Ambient sound levels can vary depending on location and conditions. The average person produces approximately 10 decibels (Db) just breathing (Purdue Noise Sources and Their Effects, table, https://www.chem.purdue.edu/chemsafety/Training/PPETrain/dblevels.htm, Accessed December 29 2015). Whispering or leaves rustling registers a noise level of 20 dB. Rural settings general produce 30 dB, quiet urban settings 40 dB, and a bird call recorded 44 dB (Purdue 2015 {bird species not identified}). It was assumed that ambient sound for the WPCI programmatic analysis would likely range from 30 decibels (dB) to 44 dB, assuming no manmade influences, such as roads or agricultural operations were nearby. Distances whereby pipeline installation and operation related noise would attenuate to ambient levels would depend on local conditions such as vegetation cover and density, topography, weather conditions, and wind. Noise levels associated with some common equipment and activities that would be present during pipeline construction and operation include, but is not limited to: chainsaws 84 dB at 50 feet (FHWA at http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm accessed 12/29/15); dump truck 76 db at 50 feet (FHWA); bulldozer 82 dB at 50 (FHWA); compressor 78 dB at 50 feet (fhwa); and an excavator 81 dB at 50 feet (FHWA).

Research has demonstrated varying short-term reactions of wildlife to noise; however, specific studies to determine impacts on wildlife from typical pipeline construction noises have not been conducted. Most research has focused on wildlife reaction to noise generated by roads and high-volume traffic (*e.g.,* Forman and Alexander, 1998). However, some research has recorded wildlife reaction to activities that could produce similar reactions from noises associated with pipeline construction activities (airplanes, sonic booms, helicopters, artillery, and blasting). Mule deer have been documented to respond to short-duration blasting with alert postures. The mule deer observed in the study occasionally ran for short distances after the noise event but did not shift home ranges (Ihsle, 1982). Mule deer did avoid areas of blasting that were closer (0.6 mile or less) but whether the avoidance was due to human presence, noise, or a combination of the factors was not distinguishable (Horejsi, 1979).

Construction-related sounds may have an adverse impact on raptors and bird species during nesting and breeding. These impacts occur when noise levels substantially exceed ambient conditions that existed prior to a project and/or when the total sound level exceeds 90 dB. Such impacts could potentially result in nest abandonment, egg failure, or reduced survival rates for young. While this could represent an adverse impact for the first year of compressor station operation as birds in the area are subjected to the novel noise source, in subsequent years birds and other wildlife would either acclimate to the noise, or would relocate to similar available plant communities away from the noise source. This, in turn, could lead to increased competition for preferred environments, depending on the amount of habitat available.

Overall, impacts on wildlife due to construction noise would be temporary and spatially localized, and operational noise of possible pipelines would not represent a significant impact on local wildlife.

Noxious and Invasive Species

Temporary and permanent impacts on wildlife and wildlife resources could occur if pipeline construction spreads noxious weeds and other invasive species. Noxious weeds can outcompete native vegetation and displace native species by spreading rapidly and co-opting resources (i.e., nutrients, water, and sunlight) that can eventually lead to a weed-dominated vegetative community. Such transformed habitat can be unsuitable to former wildlife inhabitants. Often, as habitat quality degenerates, wildlife relative abundance declines. For example, purple loosestrife (a wetlands obligate perennial forb) forms dense monocultures that inhibit native vegetation from flourishing, cause a decrease in plant species diversity, limit water flow and wildlife access to water, and in some instances make waterfowl nesting areas unsuitable (Whitson, 1996). For further description on the impact noxious and invasive plant species can have on the native plant communities, please refer to the Vegetation Resources chapter.

The WPCI POD (Appendices E, F, and H) has identified construction and restoration procedures to minimize impacts on wildlife habitat and reduce and control the spread of noxious and invasive weeds. The Vegetation Resources chapter identifies potential noxious weed species to be encountered as part of the WPCI and suggests conservation measures to limit the impact of invasive plant species.

Aboveground Facilities

The majority of the pipeline infrastructure that would likely be installed as part of the final WPCI project would be buried (e.i. pipe); however, some maintenance and operations apparatus would need to remain above ground. For safety, maintenance and operational control block valves, piggy equipment, and compressor/pump stations are likely necessary for any pipeline installed in the WPCI corridor. Block valves (Figure 1) are used to isolate portions of the pipeline and restrict the flow of material though the pipeline. For example, block valve are installed and used to close a portion of the pipeline if a leak is detected. The leaking sections can be isolated and emptied to stop the leak and repairs can be made safely. Block valve location area anticipated to be relatively small (approximately 30 ft by 30 ft) and are further expected to be fenced to exclude wildlife and unauthorized human entrance (WPCI Plan of Development).

Figure 1. Example of a block valve installed on a buried pipeline.

Pigging a pipeline refers to the maintenance or operational activity of sending internal pipeline cleaning, monitoring or inspection equipment through the pipe. Pigging station (Figure 2) generally include a sequence of riser pipes and valves to insert and catch the various type of pipeline equipment, or pigs (Figures 3 and 4). Pigging equipment is anticipated to be co-located with other above ground pipeline apparatus, such as block valve locations. Pigging equipment too is anticipated be fence to excluded wildlife and unauthorized human entrance (WPCI Plan of Development).

Figure 2. Example of pigging station on a buried pipeline.

Figure 3. Example of pipeline cleaning pig.

Figure 4. Example of a "Smart Pig" pipeline inspection pig.

Pump and compressor station are used to maintain stable pressure through-out a pipeline segment so that the pipeline can operate efficiently. Pipeline pump and compressor stations generally include a series of manifolds, pumps, power distribution equipment and a control building (Figure 5). In some circumstances, pump and compressor stations may also include piggy facilities and their own power generating equipment (for emergency operation). Pump and compressor stations can be up to several acres (WPCI Plan of Development), depending on the product being transferred within the pipeline, topography where the pipeline is located, number of pump/compressor stations along the pipeline, length of pipeline segment, and other pipeline specific details. Do to the operation importance pump/compressor station pose, these facility too are anticipated to be fenced to exclude wildlife and unauthorized human entrance.

The necessity, size, and location of potential above ground pipeline apparatus, block valves, piggy stations, and pump/compressor stations, would be dependent on each individual proposed pipeline to be located within the WPCI. As such, it is not possible at this time to describe any quantitative impacts these feature would have. However, as all of the features would remain above ground, they would eliminate the area they occupy from being used by wildlife. Future individual pipeline project proponents would need to address the impacts associated with these above ground features.

Figure 5. Example of a natural gas pipeline compressor station.

Big Game Species

Big game species hold an important ecological, economic, recreational and aesthetic role in many states and Wyoming is no different. The WPCI proposed corridors contains potential habitat for several important big game species (Table 2).

Table 2. Potential Impacts to Big Game Crucial Habitat.

Species	Type of Crucial Habitat	Area of impact (Acres)
Elk (*Cervus elaphus*)	Crucial Winter	5,138.47
	Crucial Winter/Yearlong	151,571.30
	Crucial Severe Winter Relief	5,867.98
Mule Deer (*Odocoileous hemionus*)	Crucial Winter	75,954.33
	Crucial Winter/Yearlong	447,623.80
Pronghorn(*Antilocarpa Americanan*)	Crucial Winter/Yearlong	946,447.13
Moose (*Alces alces sherasi*)	Crucial Winter	578.56
	Crucial Winter/Yearlong	40,233.92
Bighorn Sheep (*Ovis Canadensis*)	Crucial Winter/Yearlong	2,030.58

Elk

The American elk (*Cervus elaphus*) is the second largest deer species in North America, moose (*Alces alces*) being the largest. In Wyoming, the American elk is simply and commonly referred to as elk. Elk are known to migrate seasonally depending on weather conditions, spending spring and summer at higher elevations only to retreat to lower ground when weather and snow makes

foraging difficult. Elk are generalist in their dietary habits, grazing on mostly grasses in the summer while browsing on bark, shrubs, and twigs through winter. Calving in late May in to June usually occurs in areas with abundant food and cover as well as a reliable water supply.

Mule Deer

Mule deer (*Odocoileus hemionus*) can be found throughout Wyoming, from the grasslands and agricultural lands, to foothill shrublands, and arid canyonlands. Mule deer are generally found at higher densities in shrublands and sagebrush plant communities with lower densities in urban and suburban settings. Like elk, mule deer migrate seasonally from higher elevations in the spring and summer to lower elevations in the winter to avoid punishing weather conditions. Mule deer may feed on grasses in spring and summer but are primarily browsers feeding on the leaves and tender twigs of shrubs and trees.

White-tailed Deer

White-tailed deer (*Odocoileus virginianus*) are far less dispersed than mule deer in the state. These deer are commonly confined to agricultural lands with ample patches of shelter, river valleys, riparian areas, and other wetter landscapes with dense vegetation and cover. Because of this preference for lush understories of streamside woodlands and agriculture, white-tailed deer do not need to migrate to survive winters or to find ample forage during poor weather. White-tailed deer commonly browse on the leaves and twigs of trees and shrubs but will graze on grasses and forbs in the spring and summer.

Pronghorn Antelope

The pronghorn antelope (pronghorn) (*Antilocarpa americanan*) is a species unique to North America and a devoted resident of open, treeless environments. Pronghorn can be found in the eastern plains, grasslands, semi-desert shrublands, and other rolling topography that offers extended visibility. Pronghorns are dominantly browsers feeding on sagebrush and other leafy forage enabling them not to compete with cattle and livestock for food resources. Pronghorn does separate from the herd to give birth from May to mid-June and fawns are bedded in areas dominated by grasslands as a means to conceal the young from predators. After three to six weeks of separation, does, with their fawns, return to form herds (Armstrong 2011).

Moose

Moose are the largest member of the deer family with males being immediately recognizable with their huge antlers that can measure over 6 feet in width. Wyoming is home to the Shiras moose (Alces alces sherasi) subspecies of moose. Moose can generally be found in forest edge plant communites and close to water. Moose require large masses of browse including stems, barks, buds, and leaves. Because of this feeding habit, moose benefit from early successional growth as a result of recent burns, logging, beaver activity or other disturbances. Normally, moose in Wyoming inhabit a mix of willows, spruce, fir, aspen and alders. Willow stands are an important winter food staple for moose but they will also eat pinecones and various shrubs to survive the winter months.

Bighorn Sheep

Bighorn sheep (*Ovis canadensis*) are a stocky bodied sheep that inhabits steep, mountainous terrain and non-forested areas that provide sufficient food and water with cliffs for easy escape routes. They are generally found in open areas of grasses, low shrubs, and rocky ground. Primarily grazers, bighorn sheep feed in meadows, open woodlands, and alpine tundras. While various grasses make up the majority of their diet, bighorn also graze on available forbs such as clover and phlox and browse on short trees and shrubs like winterfat (*Krascheninnikovia lanta*), bitter brush (*Purshia tridentata*) and willow (*Salix spp.*).

The WPCI proposed corridors cross important resources for elk, mule deer, pronghorn, moose, and bighorn sheep. Wyoming Game and Fish have adopted several habitat components and definitions as originally developed by the Wyoming Chapter of the Wildlife Society. Specifically, WGFD has accepted the definition and terminology of crucial ranges as it relates to big game species. Crucial range has generally been defined as those habitat components that have been documented as a determining factor in a population's ability to be maintained at a given level over a period of time (Kilpatrick 2006), including:

- Severe Winter Relief − "A documented survival range which may or may not be considered a crucial range as defined above. It is used to a great extent, only in occasionally extremely severe winters (e.g., 2 years out of 10). It may lack habitat characteristics which would make it attractive or capable of supporting major portions of the population during normal years but is used by and allows at least a significant portion of the population to survive the occasional extremely severe winter."
- Winter Range − "A population or portion of a population of animals use the documented suitable habitat within this range annually, in substantial numbers only during the winter (variable, but commonly between 12/1 and 4/40). (11/15 – 4/30, adopted by WGFD in 2004)"
- Winter/Yearlong Range − "A population or a portion of a population of animals make general use of the documented suitable habitat within this range on a year−round basis. But during the winter months (commonly between 12/1 and 4/30), there is a significant influx of additional animals into the area from other seasonal ranges. (11/15 – 4/30, adopted by WGFD in 2004)"

Migration is common behavioral strategy that allows animals to exploit seasonal peaks in forage quality (Fryxell and Sinclair 1988). Most ungulates in Wyoming are migratory (Sawyer et al. 2005) and worldwide, migratory ungulates far outnumber their non-migratory counterparts (Fryxell et al. 1988). Ungulate migrations are in decline across the globe, due in large part to human-related disturbances (Bolger et al. 2008). Energy and mineral development can influence the migration behavior of big game by causing animals to speed up through disturbed areas (Lendrum et al. 2012, 2013, Sawyer et al. 2013, Blum et al. 2015). The increased movement rates can result in decreased use of stopovers (Sawyer et al. 2013). Reducing stopover use is concerning because those areas allow animals to track vegetation phenology and animals spend 95% of migration periods in stopovers (Sawyer and Kauffman 2011). In some cases, energy development can cause animal to detour or avoid routes (Sawyer et al. 2013, Skarin et al. 2015). Other recent work

has shown that roads can delay ungulate migration (Wilson et al. 2016). Relatedly, properly designed crossing structures can mitigate the impacts of roads on some migratory ungulates (Sawyer et al. 2012, 2016).

The WPCI proposed corridors also cross several important migration corridors (Appendix B). The corridor crosses 6 moose migrations routes, 41 mule deer migration routes, 3 big horn sheep migration routes, and 103 pronghorn migration routes (WGFD 2015). Impacts to big game species migration routes and crucial habitat would need to be addressed by individual pipeline project proponents. However, individual pipeline project proponents would be required to adhere to the conditions of the Upland Erosion Control, Revegetation, and Maintenance Plan (WPCI POD Appendix E), the Restoration and Revegetation Plan (WPCI POD Appendix F), the Biological Resources Conservation Measure Plan (WPCI POD Appendix I) and observe the construction timing restrictions identified in the WPCI POD, Appendix B, Table 3 in an effort to minimize impact to big game species in the pipeline corridor. Additionally, concerns have been expressed that during construction, open pipeline trenches could trap big game and wildlife of all sizes. To minimize the possibility of trapping wildlife in open trenches, it has been recommended in previous pipeline projects to periodically maintain crossing feature such that big game species and other wildlife would be able to safely cross the corridor during construction. The implementation of crossing features may also aid to minimize impact to big game migration. Furthermore, ramps have been recommended in previous pipeline projects to allow wildlife the opportunity to exit a trench if by chance an animal fell into a trench. Individual pipeline project proponents should consult with Wyoming Game and Fish Department on best practices to minimize impacts to migrating big game and other wildlife.

Small Game Species

Small game species in Wyoming contribute a significant economic, recreation, and aesthetic value to the state. Small game species can be generally broken down into four categories (WGFD 2015): upland birds; migratory game birds, small game mammals, and furbearers. Upland birds include game species like grouse, pheasant, chukar, and partridge. Migratory game bird species include common waterfowl species like ducks, geese, coots, mergansers, rails, and snipe, but also crows, mourning doves, and sandhill cranes. Small mammal game species includes cottontail rabbits, snowshoe hares, and red, gray, and fox squirrels. Finally, furbearer species include beaver, mink, weasel, marten, bobcat, and badger. A complete list of Wyoming Game and Fish Department identified small game species and are listed below by general category (Table 3).

Table 3. Wyoming small game species.

Common Name	Scientific Name
Sage Grouse	*Centrocercus urophasianus*
Blue Grouse (Dusky Grouse)	*Dendragapus obscurus*
Ruffed Grouse	*Bonasa umbellus*
Sharp-tailed Grouse	*Tympanuchus phasianellus*
Gray Partridge (Hungarian partridge)	*Perdix perdix*
Chukar	*Alectoris chukar*
Ring-necked pheasant	*Phasianus colchicus*
Wild turkey	*Meleagris gallopavo*
American Wigeon	*Anas americana*
Bufflehead	*Bucephala albeola*
Mallard	*Anas platyrhynchos*
Northern Pintail	*Anas acuta*
Northern Shoveler	*Anas clypeata*
Canvasback	*Aythya valisineria*
Redhead	*Aytha americana*
Ruddy duck	*Oxyura jamaicensis*
Lesser Scaup	*Aytha affinis*
Wood duck	*Aix sponsa*
Cinnamon Teal	*Anas cyanoptera*
Blue-winged teal	*Anas discors*
Green-winged teal	*Anas crecca*
Common Goldeneye	*Bucephala clangula*
Barrow's Goldeneye	*Bucephala islanddica*
Gadwall	*Anas strepera*
Common Merganser	*Mergus merganser*
Hooded Merganser	*Lophodytes cacullatus*
Red-breasted Merganser	*Mergus serrator*
American coot	*Fulica americanan*
Canada goose	*Branta canadensis*
Cackling goose	*Branta hutchinsii*
Greater White-fronted goose	*Anser albifrons*
Brant	*Branta bernicia*
Snow goose	*Chen caerulescens*
Ross' goose	*Chen rossii*
Sandhill crane	*Grus canadensis*
Snipe	*Gallinago delicata*
Virginia rail	*Rallus limicola*
Sora	*Porzana carolina*
American crow	*Corvas brachyrhynchos*
Mourning Dove	*Zenadia macroura*
Desert Cottontail rabbit	*Sylvilagus audubonii*
Mountain Cottontail rabbit	*Sylvilagus nutallii*
Snowshoe hare	*Lepus americanus*
Red squirrel	*Tamiasciurus hinsonicus*

Table 3. Wyoming small game species.

Common Name	Scientific Name
Fox squirrel	*Sciurus niger*
Beaver	*Castor canadensis*
American Marten	*Martes americana*
American Mink	*Mustela vison*
Bobcat	*Lynx rufus*
Muskrat	*Ondatra zibethicus*
Least Weasel	*Mustela nivalis*
Long-tailed weasel	*Mustela frenata*
Short-tailed weasel (Ermine)	*Mustela erminea*
American Badger	*Taxidea taxus*

The greater sage grouse is a Wyoming game bird; however, its habitat is a protected resource in the state and the WPCI would cross or come in close proximity to portions of the protected habitat. For further details on the protective status, possible impacts, and regulations governing greater sage grouse habitat, see Species of Concern Technical Report.

The WPCI Project's potential impacts on small game would be similar to those discussed above for general wildlife species. Species would be subject to the incremental loss of habitat and increased habitat fragmentation until restoration has been completed and native vegetation is reestablished. Waterfowl could be temporarily disturbed during construction across certain wetlands. Direct impacts on small game species could include nest or burrow abandonment, loss of eggs or young, or death. Indirect impacts could include the temporary displacement of small game from the disturbance areas as a result of increased noise and human presence. In addition, vehicle and equipment emissions and fugitive dust may also displace wildlife. There may be a shift in the movement of some individuals as a result of construction activities and disturbances that could increase collisions with vehicles along local roads. Such impacts would be temporary and animals would likely return to their home range within the WPCI Project area following construction.

Individual pipeline project proponents would be required to adhere to the conditions of the Upland Erosion Control, Revegetation, and Maintenance Plan (WPCI POD Appendix E), the Restoration and Revegetation Plan (WPCI POD Appendix F) the Biological Resources Conservation Measure Plan (WPCI POD Appendix I) and observe the construction timing restrictions (WPCI POD Appendix B Table 3) in an effort to minimize impacts to small game species by reestablishing vegetation in the pipeline corridor.

Game Harvesting

Construction of the project is anticipated to cause short-term, localized impact on hunter success rates within the project area. If construction in an area coincides with hunting seasons, hunter utilization and success in the immediate vicinity would likely be adversely affected for the duration of construction. Big game and small game specie alike would likely be displaced from areas adjacent to construction-related activities and disturbance. Game species like wildlife in general

are anticipated to return to habitats from which they had vacated after construction and restoration efforts are completed, therefore these impacts only pose a temporary impact on hunter opportunity and possible success.

Hunter success or harvest rates have a potential to increase after construction. Hunters may have the opportunity to use the pipeline right-of-way to access remote or previously inaccessible areas, depending on landowners' permissions. Additionally, some game species, such as deer (Halls 1984), benefit from edge habitat and new growth, potentially offering hunters new opportunities post construction. Increased access as a result of the cleared pipeline right-of-way could increase poaching of game animals and non-game wildlife. Individual pipeline project proponents would need to coordinate with landowners and land managing agencies to determine appropriate responses to OHV and other access issues. Installation of fences, gates with locks, blockades, and/or berms to prevent or discourage unauthorized access to the right-of-way, maybe required as a condition of landowners and land managing agencies.

Raptors and Other Migratory Birds

The variety of ecosystems in the proposed corridors hold suitable habitat for a diverse array of raptors, waterfowl, songbirds and other avian species. Raptor habitat can generally be classified as areas of suitable nesting locations and perches, such as large tall trees and snags, step cliffs and ledges, or rock outcroppings, with foraging grounds available. These criteria can change depending on the species of raptor. Raptors frequently return to the same nest or nesting area year after year.

A general dictionary definition of migratory bird may include birds that travel from one point to another at a standard time of year, usually over a long distance. The regulatory definition within the Migratory Bird Treaty Act of 1918 is slightly more specific: a migratory bird that belongs to family or group of birds present in the United States and the four nations the United States has signed migratory bird treaties with, including Canada, Mexico, Japan, and the Russia (US Fish and Wildlife Service 2015). Based on either definition, the term "migratory birds" includes a wide variety of birds; waterfowl, songbirds, humming birds, shorebirds, woodpeckers, pelicans, etc. These varieties of birds occupy a wide range of vegetative communities and environments.
A review of possible raptor nests within the proposed corridors area on the WISDOM database identified nearly 1,000 raptor nests within 1-mile of the Project corridor. A list of the raptor species and the number of nests documented in WISODM within one-mile of the WPCI project is included in Table 4 below.

Table 4. Documented Raptor nests within 1-mile of the WPCI Proposed Corridors.

Scientific Name	Common Name	Number of Nest Documented.
Accipiter cooperii	Cooper's Hawk	1
Accipiter striatus	Sharp-shinned Hawk	1
Aquila chrysaetos	Golden Eagle	207
Asio otus	Long Eared Owl	4
Athene cunicularia	Burrowing owl	29
Bubo virginianus	Great Horned Owl	15

Table 4. Documented Raptor nests within 1-mile of the WPCI Proposed Corridors.

Scientific Name	Common Name	Number of Nest Documented.
Buteo jamaicensis	Red-tailed Hawk	77
Buteo lagopus	Rough-legged Hawk	6
Buteo regalis	Ferruginous hawk	552
Buteo swainson	Swainson's Hawk	14
Circus cyaneus	Northern Harrier	3
Falco mexicanus	Prairie Falcon	37
Falco peregrinus	Peregrine Falcon	5
Falco sparverius	American Kestrel	14
Haliaeetus leucocephalus	Bald Eagle	1
Tyto alba	Barn Owl	1
	Unknown Buteo	13
	Unknown Raptor	19
Total Documented Nests		**999**

Source: WISDOM database search performed on 12/14/15

A review of BLM documented raptor nest in proximity to the WPCI corridors suggested more than four times as many raptor nests may be present as compared to the WISDOM available data. The Raptor Nest Research Area, which included the 2-mile wide proposed corridors and an additional 1-mile buffer for a total research area of four miles wide for the entire length of teh proposed corridors, contained 4,459 BLM recorded raptor nests. BLM identified nest locations are illustrated as buffered locations of various widths so as not to identify exact nest locations on Figure 6. Raptor nests identified in the BLM data includes but is not limited to red-tailed hawk, bald eagle, ferruginous hawk, prairie falcons, American kestrel, great horned owl, and other known and unknown raptor nests.

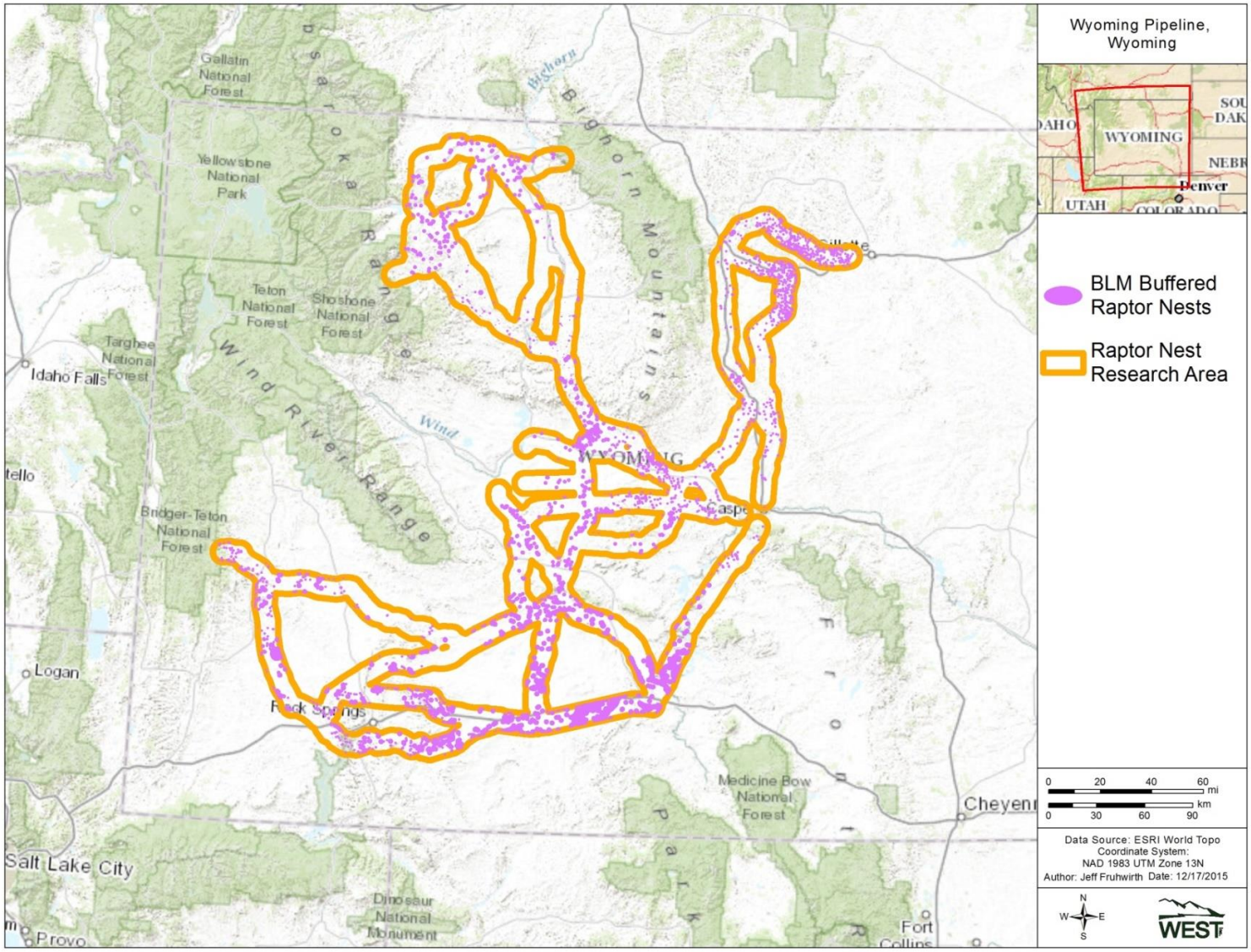

Figure 6. BLM documented raptor nest near the WPCI proposed corridors

Raptors are protected under the Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (Eagle Act). The MBTA prohibits most activities that harm migratory birds, as defined by the Migratory Bird Treaty Act of 1918 (USFWS 2015), their nest, and eggs, including removal of active nest that would likely result in loss of eggs or young USFWS 2015). The Eagle Act prohibits knowingly collecting, possessing, disturbing, or killing a bald or golden eagle. The US Fish and Wildlife Service's Wyoming Ecological Services Field Office has established spatial and temporal buffers for constructions project, including pipeline construction projects, for various raptor species. Wyoming Ecological Services Field Office recommended buffers are listed in Table 5 below.

Table 5: US Fish and Wildlife Service's Wyoming Ecological Services Field Office Recommended Spatial and Temporal Buffer during Construction Activities for Raptor Species.

Scientific Name	Common Name	Spatial Buffer (miles)	Seasonal Buffer
Accipiter cooperii	Cooper's Hawk	0.25	March 15 – August 31
Accipiter gentilis	Northern Goshawk	0.5	April 1 - August 15
Accipiter striatus	Sharp-shinned Hawk	0.25	March 15 – August 31
Aegolius acadicus	Northern Saw-whet Owl	0.25	March 1 - August 31
Aegolius funereus	Boreal Owl	0.25	February 1 – July 31
Aquila chrysaetos	Golden Eagle	0.5	January 15 - July 31
Asio flammeus	Short-eared Owl	0.25	March15- August 1
Asio otus	Long Eared Owl	0.25	February 1 – August 15
Athene cunicularia	Burrowing owl	0.25	April 1 – September 15
Bubo virginianus	Great Horned Owl	0.125	December 1 – September 31
Buteo jamaicensis	Red-tailed Hawk	0.25	February 1 – August 15
Buteo regalis	Ferruginous hawk	1	March 15 - July 31
Buteo swainson	Swainson's Hawk	0.25	April 1 - August 31
Circus cyaneus	Northern Harrier	0.25	April 1 - August 15
Falco columbarius	Merlin	0.5	April 1 - August 15
Falco mexicanus	Prairie Falcon	0.5	March 1 - August 15
Falco peregrinus	Peregrine Falcon	0.5	March 1 - August 15
Falco sparverius	American Kestrel	0.125	April 1 – August 15
Glaucidium gnoma	Northern Pygmy Owl	0.25	April 1 – August 1
Haliaeetus leucocephalus	Bald Eagle	0.5	January 1 – August 15
Megascops asio	Eastern Screech Owl	0.125	March 1 – August 15
Megascops kennicottii	Western Screech Owl	0.125	March 1 – August 15
Pandion haliaetus	Osprey	0.25	April 1 - August 31
Strix nebulosa	Great Gray Owl	0.25	March 15 – August 31
Tyto alba	Barn Owl	0.125	February 1 – September 15

Source: USFWS Wyoming Ecological Services' Species of Concern, Raptors in Wyoming webpage. (http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html), accessed December 14, 2015

Appendix B Table 3 of the WPCI POD lists these same buffers for pipeline construction activities in the vicinity of raptors, and raptor nests and includes additional recommended buffers for other species and specific habitat requirements such as sage grouse leks and antelope crucial winter range. Buffers may require modification base on site specific or project specific details, therefore it is recommended that individual pipeline project proponents consult with the Wyoming Ecological Services Field Office and Wyoming Game and Fish Department. As part of any proposed consultation with the Wyoming Ecological Services Field Office concerning raptors, it is recommended that individual pipeline project proponents follow the steps outlined on their webpage: http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html.

In addition to the thousands of documented raptor nest in and near the proposed WPCI corridors, it is highly probable that thousands of non-raptor migratory birds also nest in the area. Birds likely to be found in the WPCI proposed corridors are listed in Appendix A. The loss and fragmentation of plant communities are often assumed to negatively impact bird populations due to increased predation, reduced suitable nesting and stopover areas, decreased habitat suitability, and alteration of prey availability. Potential negative effects of the WPCI on bird populations include habitat fragmentation and loss, from construction and placement of facilities and associated access roads, which would reduce the size of contiguous patches of bird habitat and would potentially result in short-term and long-term changes in vegetation structure and composition.

Special Wildlife Areas

The WPCI corridors cross or comes in close proximity to 2 National Wildlife Refuges and 15 wild horse Herd Management Areas.
Wildlife Refuges

Pathfinder National Wildlife Refuge ,located 47 miles southwest of Casper, is comprised of four parcels, Sweetwater Arm, Goose Bay, DeWeese Creek and Sage Creek, and covers over 16,800 acres. The refuge was originally established in 1909 and is situated in a high plains basin on the Pathfinder Reservoir and North Platte River. The refuge is jointly managed by the USFWS, BLM, BOR, WGFD, and Natrona County Parks. Pathfinder Reservoir, the result of BOR construction of Pathfinder Dam on the North Platte River, is an important waterbody for migratory waterfowl in this semi−arid region of Wyoming. The open water of the refuge is used by forty species of waterfowl, shore birds, and wading birds during migration and nesting seasons. Upland sagebrush vegetation within the refuge supports greater sage grouse, antelope, and additional sagebrush community dependent species. The WPCI proposed corridors does not cross the Pathfinder NWR, but is in close proximity to the facility. Future individual pipeline project proponents may want to contact the refuge to confirm pipeline construction, operation and maintenance activities would not interfere with the refuge or its mission.

Seedskadee National Wildlife Refuge, located on the Green River in Sweetwater County, is a 27,230 acres refuge of riparian, wetland, and upland shrub plant communities. The refuge sits on 36 miles of Green River and is home to bald and golden eagles, Shiras moose, pronghorn, mule deer, white-tailed deer, elk, river otter, and greater sage grouse. In addition to upland species,

Seedskadee NWR is an important migration route for neotropical birds and trumpeter swans. A proposed corridor crosses approximately 645 acres of the Seedskadee NWR. Future individual pipeline project proponents would need to consult with refuge staff to address impacts to wildlife and the refuge lands, direct and indirect and temporary and permanent impacts.

Wild Horse Herd Management Areas

The BLM and USFS protect, manage, and control wild horses and burros under the authority of the Wild Free-Roaming Horses and Burros Act of 1971 (WHBA) to ensure that healthy herds thrive on healthy rangelands. Under the WHBA, the BLM is required to manage wild horses and burros in those specific areas (Herd Management Areas) where they were found when the WHBA was passed in 1971.

According to BLM's Wild Horse and Burro Program, Wyoming is home to approximately 3,700 wild horses based on March 2015 estimates (http://www.blm.gov/wo/st/en/prog/whbprogram/history_and_facts/quick_facts.html) (accessed Dec 4, 2015). Wyoming's wild horses are generally located on 16 Wyoming Herd Management Areas (HMA). Excluding only the Adobe Town HMA on the Wyoming−Colorado border, proposed corridors cross 15 of the HMAs (http://www.blm.gov/wy/st/en/programs/Wild_Horses/maps/interactive-map.html) The 15 HMAs are managed by four separate BLM field offices: Rock Springs; Lander: Worland; and Cody. The Rock Springs BLM field Office manages the Salt Wells, White Mountain, Little Colorado, Divide Basin, Lost Creek and Stewart Creek HMAs. BLM's Rawlins field office manages the Lost Creek and Stewart Creek HMAs. The Rawlins Field Office also manages wild horses on the Adobe Town HMA. Antelope Hills, Crooks Mountain, Conant Creek, Dishpan Butte, Green Mountain, Muskrat Basin and Rock Creek HMAs are managed through the Lander field office of the BLM. Lastly the BLM Cody Field Office manages wild horse herds on the McCullough Peaks HMA and the Worland BLM Field Office manages the Fifteenmile HMA.

Individual pipeline proponents would need to consult with the specific BLM field offices to identify and address concerns and possible impacts to wild horse herds in the proposed corridor. Based on previous NEPA review for similar pipeline projects, some BLM field offices (not within Wyoming) described concerns and mitigation recommendations addressing wild horse's access to water. Additionally, concerns have been expressed that during construction, open pipeline trenches would periodically maintain crossing features such that wild horses would be able to safely cross the corridor during construction. Furthermore, BLM has previously requested ramps be installed in open trenches to allow horses an opportunity to exit a trench if a horse, by chance, fell into an open trench. BLM offices have also requested construction crews be educated on the protections awarded to wild horses and that signage be placed in the construction areas where horse maybe present to minimize vehicle/horse accidents. Finally, concerns were expressed that wild horse may inhibit revegetation efforts as wild horse may graze on new plant growth. It is reasonable to assume similar concerns would be articulated by regulatory authorities and possibly the general public. Individual pipeline proponents would need to consult with the BLM and address any such concerns to the satisfaction of the specific field offices.

References

Armstrong, D. M., J. P. Fitzgerald, and C. A. Meany. 2011. Mammals of Colorado (Second Edition). University Press of Colorado, Boulder Colorado.

Blum, M.E., Stewart, K.M. & Schroeder, C. (2015) Effects of large-scale gold mining on migratory behavior of a large herbivore. *Ecosphere*, 6, 74.

Bolger, D.T., Newmark, W.D., Morrison, T.A. & Doak, D.F. (2008) The need for integrative approaches to understand and conserve migratory ungulates. *Ecology Letters*, 11, 63–77.

Brusnyk, L.M., and D.A. Westworth. 1985. An Assessment of Post-construction Use of a Pipeline Corridor by Ungulates. Unpublished report for NOVA, An Alberta Corporation, Calgary, Alberta

Cadenasso M. L, S. T. A. Pickett, K. C. Weathers, C. G. Jones . 2003. A framework for a theory of ecological boundaries. BioScience 53:750–758

Connelly, J. W., S. T. Knick, M. A. Schroeder, and S. J. Stiver. 2004. Conservation Assessment of Greater Sage-Grouse and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming. Pp. 7-46.

Federal Highway Administration (FHWA). 2015. Construction Noise Handbood avaialbel at http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm Accessed December 29, 2015.

Fryxell, J.M. & Sinclair, A.R.E. (1988) Causes and consequences of migration by large herbivores. *Trends Ecol Evol*, 3, 237–241.

Fryxell, J.M., Greever, J. & Sinclair, A.R.E. (1988). Why are migratory ungulates so abundant? *American Naturalist*, 131, 781–798.

Hagen, Sandra K., Patrick T. Isakson, and Steve R. Dyke. 2005. North Dakota Comprehensive Wildlife

Halls, Lowell K. 1984. White-tailed Deer: Ecology and Management. Stackpole Book, Harrisburg, Pennsylvania.

Hartley, D.R., D.H. Arner, and J.W. Lipe. 1984. A Comparison of Right-of-way Maintenance Treatments and Use by Wildlife. Proceedings of the Third International Symposium on Environmental Concerns in Rights-of-way Management. Mississippi State University, Mississippi State, Mississippi. 623-629.

Horejsi, B.L. 1979. Seismic operations and their impact on large mammals: results of a monitoring program. Western Wildlife Environments. Unpublished Report. 86 pp

Ihsle, H.B. 1982. Population Ecology of Mule Deer with Emphasis on Potential Impacts of Gas and Oil Development along the East Front of the Rocky Mountains, North Central Montana. M.S. Thesis, Montana State University, Bozeman, Montana.

Kilpatrick, S. 2006. Re: Standardized Definitions for Seasonal Wildlife Ranges. Unpublished letter dated December 14, 2006 from Steve Kilpatrick, President, The Wildlife Society Wyoming Chapter to Bill Rudd, Assistant Div. Chief, Wildlife Division, Wyoming Game & Fish Dept.

Kroodsma, R.L. 1984. Effects of Power-line Corridors on the Density and Diversity of Bird Communities in Forested Areas. Proceedings of the Third International Symposium on Environmental Concerns in Rights-of-way Management. Mississippi State University, Mississippi State, Mississippi: 551-561.

Lendrum, P. E., C. R. Anderson, R. A. Long, J. G. Kie, and R. T. Bowyer. 2012. Habitat selection by mule deer during migration: effects of landscape structure and natural-gas development. *Ecosphere* 3:art82.

Lendrum, P.E., Anderson Jr., C.R., Monteith, K.L., Jenks, J.A. & Bowyer, R.T. (2013) Migrating mule deer: effects of anthropogenically altered landscapes. *PLoS ONE* 8,e64548.

Natural Resource Conservation Service (NRCS). 2009. New Hampshire Conservation Practice Job Sheet 645, available at http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1081685.pdf accessed December 29, 2015.

Purdue University. 2002. Purdue Noise Sources and Their Effects, Table, https://www.chem.purdue.edu/chemsafety/Training/PPETrain/dblevels.htm , Accessed December 29, 2015.

Rosenberg, K.V., and M.G. Raphael. 1986. Effects of Forest Fragmentation on Vertebrates in Douglasfir Forests. Pages 263-272 in J. Verner, M.L. Morrison, and C.J. Ralph (editors), Wildlife 2000: Modeling Habitat Relationships of Terrestrial Vertebrates. University of Wisconsin Press. Madison, Wisconsin.

Sawyer, H., Lindzey, F., & McWhirter, D. (2005) Mule deer and pronghorn migration in western Wyoming. *Wildlife Society Bulletin*, 33, 1266–1273.

Sawyer, H., Kauffman, M.J., Nielson, R.N. & Horne, J.S. (2009) Identifying and prioritizing ungulate migration routes for landscape-level conservation. *Ecological Applications*, 19, 2016–2025.

Sawyer, H. & Kauffman, M. J. (2011) Stopover ecology of a migratory ungulate. *Journal of Animal Ecology*, 80, 1078–1087.

Sawyer, H., M. J. Kauffman, A. D. Middleton, T. A. Morrison, R. M. Nielson, and T. B. Wyckoff. 2013. A framework for understanding semi-permeable barrier effects on migratory ungulates. *Journal of Applied Ecology* 50:68-78.

Sawyer, H., C. LeBeau, and T. Hart. 2012. Mitigating roadway impacts to migratory ungulates – a case study with underpasses and continuous fencing. *Wildlife Society Bulletin* 36:492-498.

Sawyer, H., P. Rodgers, and T. Hart. 2016. Overpass and underpass use by pronghorn and mule deer. *Wildlife Society Bulletin* In Press.

Skarin, A., C. Nellemann, L. Ronnegard, P. Sandstrom, and H. Lundqvuist. 2015. Wind farm construction impacts reindeer migration and movement corridors. *Landscape Ecology* 30:1527-1540.

United States Bureau of Land Management (BLM). 2015. BLM's Wild Horse and Burro Program. webpage, available at http://www.blm.gov/wo/st/en/prog/whbprogram/history_and_facts/quick_facts.html. Accessed Dec 4, 2015.

U.S. Fish and Wildlife Service. 2015. Digest of Federal Resource Laws of Interest to the U.S. Fish and Wildlife Service Page. Available at: http://www.fws.gov/laws/lawsdigest/migtrea.html. Accessed June 19 and July 8, 2015.

U.S. Fish and Wildlife Service. 2015. Migratory Bird Program Page. Available at: http://www.fws.gov/migratorybirds/regulationspolicies/mbta/mbtintro.html . Accessed June 18, 19, 25, 26 and July 7 and 8, 2015.

United States Fish and Wildlife Service (USFWS). Wyoming Ecological Services. 2015. Wyoming Ecological Services' Species of Concern, Raptors in Wyoming webpage, available at http://www.fws.gov/wyominges/Pages/Species/Species_SpeciesConcern/Raptors.html, accessed December 14, 2015.

Western Ecosystems Technology, Inc. (WEST). 2015. Vegetation Resources Technical Report for Wyoming Pipeline Corridor Initiative Programmatic Environmental Impact Statement. Prepared for Wyoming Pipeline Authority.

Whitson, T.D. 1996. Weeds of the West. The Western Society of Weed Science, Newark, California.

Wilson, R. R., L. S. Parrett, K. Joly, and J. R. Dau. 2016. Effects of roads on individual caribou movements during migration. Biological Conservation 195:2-8.

Wyoming Game and Fish Department (WGFD). 2010. Wyoming State Wildlife Action Plan (SWAP). WGFD, Cheyenne, Wyoming. Available online at: https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/SWAP/SWAP.pdf.

Wyoming Game and Fish Department (WGFD). 2015. Wyoming Game and Fish Department Big Game GIS Dada. Available at https://wgfd.wyo.gov/Wildlife-in-Wyoming/Geospatial-Data/Big-Game-GIS-Data, Accessed Decmebr 14, 2015.

Wyoming Game and Fish Department (WGFD). 2015. Wyoming Game and Fish Department 2015 Upland Game Bird and Small Game Hunting Brouchure. Avaialbel at https://wgfd.wyo.gov/Regulations/Regulation-PDFs/REGULATIONS_CH11_BROCHURE, Accessed December 23, 2015.

Wyoming Interagency Spatial Database & Online Management System (WISDOM). 2015. Wyoming Interagency Spatial Database & Online Management System. Available at http://wisdom.wygisc.org/, Accessed on December 14, 2015.

Wyoming Pipeline Authority (WPA). 2014. Wyoming Pipeline Corridor Initiative, Plan of Development (POD). May 2014.

Appendix A: List of Species Potentially Occurring within the Wyoming Pipeline Corridor Initiative Proposed Corridors

Table A-1. Wildlife species potentially occurring within the proposed corridors.

Scientific Name	Common Name	Type
Ambystoma mavortium	Tiger Salamander	Amphibian
Anaxyrus boreas boreas	Boreal Western Toad (Northern Rocky Mountain Population)	Amphibian
Anaxyrus boreas pop. 1	Boreal Western Toad (Southern Rocky Mountain Population)	Amphibian
Anaxyrus cognatus	Great Plains Toad	Amphibian
Anaxyrus woodhousii	Woodhouse's Toad	Amphibian
Anaxyrus baxteri	Wyoming Toad	Amphibian
Pseudacris maculate	Boreal Chorus Frog	Amphibian
Spea bombifrons	Plains Spadefoot Toad	Amphibian
Spea intermontana	Great Basin Spadefoot Toad	Amphibian
Lithobates catesbeianus	Bullfrog	Amphibian
Lithobates pipiens	Northern Leopard Frog	Amphibian
Lithobates blairi	Plains Leopard Frog	Amphibian
Lithobates sylvaticus	Wood Frog (Statewide)	Amphibian
Lithobates sylvaticus pop. 1	Wood Frog (Bighorn Mountain Wood Frog)	Amphibian
Lithobates sylvaticus pop. 2	Wood Frog (Southern Rockies Wood Frog)	Amphibian
Rana luteiventris	Columbia Spotted Frog (Statewide)	Amphibian
Rana luteiventris pop. 4	Columbia Spotted Frog (Bighorn Mountain Spotted Frog)	Amphibian
Gavia immer	Common Loon	Bird
Aechmophorus occidentalis	Western Grebe	Bird
Aechmophorus clarkii	Clark's Grebe	Bird
Phalacrocorax auritus	Double-crested Cormorant	Bird
Pelecanus erythrorhynchos	American White Pelican (Breeding Colonies)	Bird
Botaurus lentiginosus	American Bittern	Bird
Ixobrychus exilis	Least Bittern	
Ardea herodias	Great Blue Heron	Bird
Egretta thula	Snowy Egret	Bird
Nycticorax nycticorax	Black-crowned Night-Heron	Bird
Plegadis chihi	White-faced Ibis	Bird
Cygnus buccinator	Trumpeter Swan	Bird
Anas acuta	Northern Pintail	Bird
Anas platyrhynchos	Mallard	Bird
Anas americana	American Wigeon	Bird
Anas strepera	Gadwall	Bird
Anas crecca	Green-winged Teal	Bird
Anas discors	Blue-winged Teal	Bird
Aythya valisineria	Canvasback	Bird

Table A-1. Wildlife species potentially occurring within the proposed corridors.

Scientific Name	Common Name	Type
Aythya americana	Redhead	Bird
Aythya collaris	Ring-necked Duck	Bird
Aythya affinis	Lesser Scaup	Bird
Histrionicus histrionicus	Harlequin Duck	Bird
Bucephala albeola	Bufflehead	Bird
Bucephala islandica	Barrow's Goldeneye	Bird
Mergus merganser	Common Merganser	Bird
Lophodytes cacullatus	Hooded Merganser	Bird
Mergus serrator	Red-breasted Merganser	Bird
Oxyura jamaicensis	Ruddy Duck	Bird
Branta Canadensis	Canada Goose	Bird
Cathartes aura	Turkey Vulture	Bird
Pandion haliaetus	Osprey	Bird
Haliaeetus leucocephalus	Bald Eagle	Bird
Aquila chrysaetos	Golden Eagle	Bird
Circus cyaneus	Northern Harrier	Bird
Accipiter striatus	Sharp-shinned Hawk	Bird
Accipiter cooperii	Cooper’s Hawk	Bird
Accipiter gentilis	Northern Goshawk	Bird
Buteo platypterus	Broad-winged Hawk	Bird
Buteo swainsoni	Swainson's Hawk	Bird
Buteo regalis	Ferruginous Hawk	Bird
Buteo lagopus	Rough-legged Hawk	Bird
Buteo jamaicensis	Red-tailed Hawk	Bird
Falco sparverius	American Kestrel	Bird
Falco columbarius	Merlin	Bird
Falco peregrinus anatum	American Peregrine Falcon	Bird
Falco peregrinus tundrius	Arctic Peregrine Falcon	Bird
Falco mexicanus	Prairie Falcon	Bird
Falco rusticolus	Gyrfalcon	Bird
Lagopus leucurus	White-tailed Ptarmigan	Bird
Alectoris chukar	Chukar	Bird
Perdix perdix	Gray Partridge *(Hungarian Partridge)*	Bird
Phasianus colchicus	Ring-necked Pheasant	Bird
Bonasa umbellus	Ruffed Grouse	Bird
Centrocercus urophasianus	Greater Sage Grouse	Bird
Tympanuchus cupido	Greater Prairie Chicken	Bird
Dendragapus obscurus	Blue Grouse (Dusky Grouse)	Birds

Table A-1. Wildlife species potentially occurring within the proposed corridors.

Scientific Name	Common Name	Type
Tympanuchus phasianellus columbianus	Columbian Sharp-tailed Grouse	Bird
Meleagris gallapavo merriami	Merriam's wild turkey	Bird
Podilymbus podiceps	Pied-billed Grebe	Bird
Podiceps auritus	Horned Grebe	Bird
Podiceps nigricollis	Eared Grebe	Bird
Aechmophorus occidentalis	Western Grebe	Bird
Aechmophorus clarkii	Clarke's Grebe	Bird
Rallus limicola	Virginia Rail	Bird
Porzana carolina	Sora	Bird
Fulica americanan	American coot	Bird
Grus canadensis	Sandhill Crane	Bird
Grus americana	Whooping Crane	Bird
Charadrius nivosus	Snowy Plover	Bird
Charadrius melodus	Piping Plover	Bird
Charadrius montanus	Mountain Plover	Bird
Charadrius vociferous	Killdeer	Bird
Himantopus mexicanus	Black-necked Stilt	Bird
Actitis macularius	Spotted Sandpiper	Bird
Bartramia longicauda	Upland Sandpiper	Bird
Tringa semipalmata	Willet	Bird
Calidris mauri	Western Sandpiper	Bird
Gallinago gallinago	Common Snipe	Bird
Gallinago delicata	Wilson's Snipe	Bird
Numenius americanus	Long-billed Curlew	Bird
Phalaropus tricolor	Wilson's Phalarope	Bird
Larus pipixcan	Franklin's Gull	Bird
Larus delawarensis	Ring-billed Gull	Bird
Larus californicus	California Gull	Bird
Sterna caspia	Caspian Tern	Bird
Sterna forsteri	Forster's Tern	Bird
Chlidonias niger	Black Tern (Breeding Colonies)	Bird
Recurvirostra Americana	American Avocet	Bird
Columba livia	Rock Pigeon	Bird
Streptopelia decaocto	Eurasian Collared-Dove	Bird
Zenaida macroura	Mourning Dove	Bird
Coccyzus americanus	Yellow-billed Cuckoo	Bird
Coccyzus erythropthalmus	Black-billed Cuckoo	Bird

Table A-1. Wildlife species potentially occurring within the proposed corridors.

Scientific Name	Common Name	Type
Pica hudsonia	Black-billed Magpie	Bird
Corus brachyrhynchos	American Crow	Bird
Corvus corax	Common Raven	Bird
Tyto alba	Barn Owl	Bird
Otus flammeolus	Flammulated Owl	Bird
Megascops kennicottii	Western Screech-Owl	Bird
Megascops asio	Eastern Screech-Owl	Bird
Glaucidium gnoma	Northern Pygmy-Owl	Bird
Athene cunicularia	Burrowing Owl	Bird
Athene cunicularia hypugaea	Western Burrowing Owl	Bird
Strix nebulosa	Great Gray Owl	Bird
Asio otus	Long-eared Owl	Bird
Asio flammeus	Short-eared Owl	Bird
Aegolius funereus	Boreal Owl	Bird
Aegolius acadicus	Northern Saw-whet Owl	Bird
Bubo virginianus	Great horned owl	Bird
Bubo scandiacus	Snowy Owl	Bird
Chordelies minor	Common Nighthawk	Bird
Phalaenoptilus nuttallii	Common Poorwill	Bird
Selasphorus rufus	Rufous Hummingbird	Bird
Archilochus alexandri	Black-chinned Hummingbird	Bird
Stellula calliope	Calliope Hummingbird	Bird
Selasphorus platycercus	Broad-tailed Hummingbird	Bird
Aeronautes saxatalis	White-throated Swift	Bird
Cypseloides niger	Black Swift	Bird
Megaceryle alcyon	Belted Kingfisher	Bird
Melanerpes lewis	Lewis' Woodpecker	Bird
Melanerpes erythrocephalus	Red-headed Woodpecker	Bird
Picoides pubescens	Downy Woodpecker	Bird
Picoides villosus	Hairy Woodpecker	Bird
Picoides albolarvatus	White-headed Woodpecker	Bird
Picoides tridactylus	American Three-toed Woodpecker	Bird
Picoides arcticus	Black-backed Woodpecker	Bird
Picoides dorsalis	American Three-toed Woodpecker	Bird
Sphyrapicus thyroideus	Williamson’s Sapsucker	Bird
Sphyrapicus nuchalis	Red-naped Sapsucker	Bird
Colaptes auratus	Northern Flicker	Bird
Contopus cooperi	Olive-sided Flycatcher	Bird

Table A-1. Wildlife species potentially occurring within the proposed corridors.

Scientific Name	Common Name	Type
Empidonax traillii	Willow Flycatcher	Bird
Empidonax minimus	Least Flycatcher	Bird
Empidonax hammondii	Hammond's Flycatcher	Bird
Empidonax wrightii	Gray Flycatcher	Bird
Empidonax oberholseri	Dusky Flycatcher	Bird
Empidonax occidentalis	Cordilleran Flycatcher	Bird
Myiarchus cinerascens	Ash-throated Flycatcher	Bird
Sayornis saya	Say's Phoebe	Bird
Contopus sordidulus	Western Wood-Pewee	Bird
Eremophila alpestris	Horned Lark	Bird
Progne subis	Purple Martin	Bird
Tachycineta bicolor	Tree Swallow	Bird
Tachycineta thalassina	Violet-green Swallow	Bird
Stelgidopteryx serripennis	Northern Rough-winged Swallow	Bird
Riparia riparia	Bank Swallow	Bird
Petrochelidon pyrrhonota	Cliff Swallow	Bird
Hirundo rustica	Barn Swallow	Bird
Vireo plumbeus	Plumbeous Vireo	Bird
Vireo gulvus	Warbling Vireo	Bird
Vireo olivaceus	Red-eyed Vireo	Bird
Perisoreus canadensis	Gray Jay	Bird
Cyanocitta stelleri	Steller's Jay	Bird
Cyanocitta cristata	Blue Jay	Bird
Aphelocoma californica	Western Scrub-Jay	Bird
Gymnorhinus cyanocephalus	Pinyon Jay	Bird
Nucifraga columbiana	Clark's Nutcracker	Bird
Poecile atricapillus	Black-capped Chickadee	Bird
Poecile gambeli	Mountain Chickadee	Bird
Baeolophus ridgwayi	Juniper Titmouse	Bird
Psaltriparus minimus	Bushtit	Bird
Sitta canadensis	Red-breasted Nuthatch	Bird
Sitta carolinensis	White-breasted Nuthatch	Bird
Sitta pygmaea	Pygmy Nuthatch	Bird
Certhia americana	Brown Creeper	Bird
Salpinctes obsoletus	Rock Wren	Bird
Catherpes mexicanus	Canyon Wren	Bird
Thryomanes bewickii	Bewick's Wren	Bird
Troglodytes aedon	House Wren	Bird

Table A-1. Wildlife species potentially occurring within the proposed corridors.

Scientific Name	Common Name	Type
Troglodytes pacificus	Pacific Wren	Bird
Cistothorus palustris	Marsh Wren	Bird
Cinclus mexicanus	American Dipper	Bird
Regulus satrapa	Golden-crowned Kinglet	Bird
Regulus calendula	Ruby-crowned Kinglet	Bird
Polioptila caerulea	Blue-gray Gnatcatcher	Bird
Sialia mexicana	Western Bluebird	Bird
Sialia currucoides	Mountain Bluebird	Bird
Myadestes townsendi	Townsend's Solitaire	Bird
Catharus fuscenscens	Veery	Bird
Catharus ustulatus	Swainson's Thrush	Bird
Catharus guttatus	Hermit Thrush	Bird
Turdus migratorius	American Robin	Bird
Dumetella carolinensis	Gray Catbird	Bird
Mimus polyglottos	Northern mockingbird	Bird
Sturnella neglecta	Western Meadowlark	Bird
Oreoscoptes montanus	Sage Thrasher	Bird
Toxostoma rufum	Brown Thrasher	Bird
Tyrannus vociferans	Cassin's Kingbird	Bird
Tyrannus verticalis	Western Kingbird	Bird
Tyrannus tyrannus	Eastern Kingbird	Bird
Lanius ludovicianus	Loggerhead Shrike	Bird
Setophaga ruticilla	American Redstart	Bird
Spiza americana	Dickcissel	Bird
Icteria virens	Yellow-breasted Chat	Bird
Pipilo chlorurus	Green-tailed Towhee	Bird
Pipilo maculatus	Spotted Towhee	Bird
Aimophila cassinii	Cassin's Sparrow	Bird
Spizella breweri	Brewer's Sparrow	Bird
Passer domesticus	House Sparrow	Bird
Pooecetes gramineus	Vesper Sparrow	Bird
Chondestes grammacus	Lark Sparrow	Bird
Spizella passerina	Chipping Sparrow	Bird
Spizella pallida	Clay-colored Sparrow	Bird
Amphispiza belli	Sage Sparrow	Bird
Calamospiza melanocorys	Lark Bunting	Bird
Plectrophenax nivalis	Snow Bunting	Bird
Ammodramus bairdii	Baird's Sparrow	Bird

Table A-1. Wildlife species potentially occurring within the proposed corridors.

Scientific Name	Common Name	Type
Passerculus sandwichensis	Savannah Sparrow	Bird
Ammodramus savannarum	Grasshopper Sparrow	Bird
Passerella iliaca	Fox Sparrow	Bird
Melospiza melodia	Song Sparrow	Bird
Melospiza lincolnii	Lincoln's Sparrow	Bird
Zonotrichia leucophrys	White-crowned Sparrow	Bird
Junco hyemalis	Dark-eyed Junco	Bird
Piranga ludoviciana	Western Tanager	Bird
Coccothraustes vespertinus	Evening Grosbeak	Bird
Pheucticus ludovicianus	Rose-breasted Grosbeak	Bird
Pheucticus melanocephalus	Black-headed Grosbeak	Bird
Pinicola enucleator	Pine Grosbeak	bird
Passerina caerulea	Blue Grosbeak	Bird
Passerina amoena	Lazuli Bunting	Bird
Passerina cyanea	Indigo Bunting	Bird
Sturnus vulgaris	European Starling	Bird
Anthus rubescens	American Pipit	Bird
Bombycilla cedrorum	Cedar Waxwing	Bird
Calcarius mccownii	Mccown's Longspur	Bird
Calcarius ornatus	Chestnut-collared Longspur	Bird
Calcarious lapponicus	Lapland Longspur	Bird
Seiurus aurocapilla	Ovenbird	Bird
Oreothlypis celata	Orange-crowned Warbler	Bird
Oreothlypis virginiae	Virginia's Warbler	Bird
Geothlypis tolmiei	MacGillivray's Warbler	Bird
Geothlypis trichas	Common Yellowthroat	Bird
Setophaga ruticilla	American Redstart	Bird
Seophaga petechia	Yellow Warbler	Bird
Setophaga coronata	Yellow-rumped Warbler	Bird
Setophaga nigrescens	Black-throated Gray Warbler	Bird
Cardellina pusilla	Wilson's Warbler	bird
Dolichonyx oryzivorus	Bobolink	Bird
Agelaius phoeniceus	Red-winged Blackbird	Bird
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	Bird
Euphagus cyanocephalus	Brewer's Blackbird	Bird
Quiscalus quiscula	Common Grackle	Bird
Molothrus ater	Brown-headed Cowbird	Bird

Table A-1. Wildlife species potentially occurring within the proposed corridors.

Scientific Name	Common Name	Type
Icterus spurius	Orchard Oriole	Bird
Icterus bullockii	Bullock's Oriole	Bird
Icterus parisorum	Scott's Oriole	Bird
Leucosticte tephrocotis	Gray-crowned Rosy-Finch	Bird
Leucosticte atrata	Black-rosy Finch	Bird
Leucosticte australis	Brown-capped Rosy Finch	Bird
Carpodacus cassinii	Cassin's Finch	Bird
Carpodacus mexicanus	House Finch	Bird
Spinus tristis	American Goldfinch	Bird
Loxia curvirostra	Red Crossbill	Bird
Spinus pinus	Pine Siskin	Bird
Acanthis hornemanni	Hoary Redpoll	Bird
Didelphis virginiana	Virginia Opossum	Mammal
Sorex cinereus	Masked Shrew	Mammal
Sorex merriami	Merriam's Shrew	Mammal
Sorex monticolus	Dusky Shrew	Mammal
Sorex preblei	Preble's Shrew	Mammal
Sorex vagrans	Vagrant Shrew	Mammal
Sorex nanus	Dwarf Shrew	Mammal
Sorex palustris	Water Shrew	Mammal
Sorex hoyi	Pygmy Shrew	Mammal
Sorex hoyi montanus	Southern Rocky Mountain Pygmy Shrew	Mammal
Sorex haydeni	Hayden's Shrew	Mammal
Scalopus aquaticus	Eastern Mole	Mammal
Myotis lucifugus	Little Brown Myotis	Mammal
Myotis evotis	Long-eared Myotis	Mammal
Myotis thysanodes	Fringed Myotis (Statewide)	Mammal
Myotis thysanodes pahasapensis	Black Hills Fringed Myotis	Mammal
Myotis volans	Long-legged Myotis	Mammal
Myotis ciliolabrum	Western Small-footed Myotis	Mammal
Myotis septentrionalis	Northern Myotis	Mammal
Myotis yumanensis	Yuma Myotis	Mammal
Lasionycteris noctivagans	Silver-haired Bat	Mammal
Eptesicus fuscus	Big Brown Bat	Mammal
Lasiurus cinereus	Hoary Bat	Mammal
Euderma maculatum	Spotted Bat	Mammal
Corynorhinus townsendii	Townsend's Big-eared Bat	Mammal

Table A-1. Wildlife species potentially occurring within the proposed corridors.

Scientific Name	Common Name	Type
Corynorhinus townsendii townsendii	Townsend's Western Big-eared Bat	Mammal
Antrozous pallidus	Pallid Bat	Mammal
Castor canadensis	American Beaver	Mammal
Ochotona princeps	American Pika	Mammal
Brachylagus idahoensis	Pygmy Rabbit	Mammal
Sylvilagus audubonii	Desert cottontail rabbit	Mammal
Sylvilagus nuttallii	Mountain cottontail rabbit	Mammal
Lepus americanus	Snow Shoe Hare	Mammal
Lepus townsendii	White-tailed jackrabbit	Mammal
Lepus californicus	Black-tailed jackrabbit	Mammal
Neotamias dorsalis	Cliff Chipmunk	Mammal
Neotamias amoenus	Yellow-pine Chipmunk	Mammal
Neotamias minimus	Least Chipmunk	Mammal
Neotamias umbrinus	Uinta Chipmunk	Mammal
Marmota flavivnetris	Yellow-bellied Marmot	Mammal
Spermophilus armatus	Uinta Ground Squirrel	Mammal
Spermophilus lateralis	Golden-mantled Ground Squirrel	Mammal
Spermophilus spilosoma	Spotted Ground Squirrel	Mammal
Spermophilus elegans	Wyoming Ground Squirrel	Mammal
Spermophilus tridecemlineatus	Thirteen-lined Ground Squirrel	Mammal
Cynomys ludovicianus	Black-tailed Prairie Dog	Mammal
Cynomys leucurus	White-tailed Prairie Dog	Mammal
Sciurus aberti	Abert's Squirrel	Mammal
Sciurus niger	Eastern Fox Squirrel	
Tamiasciurus hudsonicus	Red Squirrel	Mammal
Glaucomys sabrinus	Northern Flying Squirrel	Mammal
Thomomys clusius	Wyoming Pocket Gopher	Mammal
Thomomys idahoensis	Idaho Pocket Gopher	Mammal
Thomomys talpoides	Northern Pocket Gopher	Mammal
Geomys bursarius	Plains Pocket Gopher	Mammal
Perognathus fasciatus	Olive-backed Pocket Mouse	Mammal
Perognathus flavescens	Plains Pocket Mouse	Mammal
Perognathus flavus	Silky Pocket Mouse	Mammal
Perognathus parvus	Great Basin Pocket Mouse	Mammal
Chaetodipus hispidus	Hispid Pocket Mouse	Mammal
Dipodomys ordii	Ord’s Kangaroo Rat	Mammal
Reithrodontomys montanus	Plains Harvest Mouse	Mammal

Table A-1. Wildlife species potentially occurring within the proposed corridors.

Scientific Name	Common Name	Type
Peromyscus crinitus	Canyon Mouse	Mammal
Peromyscus truei	Pinon Mouse	Mammal
Peromyscus maniculatus	Deer Mouse	Mammal
Onychomys leucogaster	Northern Grasshopper Mouse	Mammal
Neotoma cinerea	Bushy-tailed woodrat	Mammal
Clethrionomys gapperi	Southern Red-backed vole	Mammal
Phenacomys intermedius	Western Heather Vol	Mammal
Microtus ochrogaster	Prairie Vole	Mammal
Microtus longicaudus	Long-tailed vole	Mammal
Microtus montanus	Montane Vole	Mammal
Microtus ochrogater	Prairie Vole	Mammal
Microtus pennsylvanicus	Meadow Vole	Mammal
Microtus richardsoni	Water Vole (Statewide)	Mammal
Microtus richardsoni pop. 1	Water Vole (Bighorn Mountain Population)	Mammal
Lemmiscus curtatus	Sagebrush Vole	Mammal
Ondatra zibethicus	Common muskrat	Mammal
Zapus hudsonius	Meadow Jumping Mouse	Mammal
Rattus norvegicus	Norway rat	Mammal
Mus musculus	House Mouse	Mammal
Zapus hudsonius preblei	Preble's Meadow Jumping Mouse	Mammal
Zapus princeps	Meadow Jumping Mouse	Mammal
Erethizon dorsatum	North American Porcupine	Mammal
Canis latrans	Coyote	Mammal
Canis lupus	Gray Wolf	Mammal
Vulpes velox	Swift Fox	Mammal
Vulpes vulpes	Red fox	Mammal
Urocyon cinereoargenteus	Common Gray Fox	Mammal
Ursus americanus	Black Bear	Mammal
Ursus arctos	Grizzly Or Brown Bear	Mammal
Ursus arctos horribilis	Grizzly Bear	Mammal
Bassariscus astutus	Ringtail	Mammal
Procyon lotor	Northern Racoon	Mammal
Martes americana	American Marten	Mammal
Martes americana pop. 2	American Marten (Bighorn Mountain Population)	Mammal
Martes pennanti	Fisher	Mammal
Mustela ermine	Short-tailed Weasel	Mammal
Mustela nivalis	Least Weasel	Mammal
Mustela frenata	Long-tailed Weasel	Mammal

Table A-1. Wildlife species potentially occurring within the proposed corridors.

Scientific Name	Common Name	Type
Mustela nigripes	Black-footed Ferret	Mammal
Mustela vison	American Mink	Mammal
Gulo gulo luscus	North American Wolverine	Mammal
Taxidea taxus	American badger	Mammal
Spilogale gracilis	Weastern Spotted Skunk	Mammal
Spilogale putorius	Eastern Spotted Skunk	Mammal
Mephitis mephitis	Stripped Skunk	Mammal
Lontra canadensis	River Otter	Mammal
Puma concolor	Mountain Lion (Puma)	Mammal
Felis rufus	Bobcat	Mammal
Lynx canadensis	Canada Lynx	Mammal
Cervus canadensis	North American Elk	Mammal
Odocoileus hemionus	Mule Deer	Mammal
Odocoileus virginianus	White-tailed deer	Mammal
Alces americanus	Moose	Mammal
Antilocarpa americana	Pronghorn antelope	Mammal
Bos bison	Bison	Mammal
Oreamnos americanus	Mountain Goat	Mammal
Ovis canadensis	Bighorn Sheep	Mammal
Chrysemys picta	Western Painted Turtle	Reptile
Chelydra serpentina	Eastern Painted Turtle	Reptile
Apalone spinifera hartwegi	Western Spiny Softshell	Retile
Terrapene ornata	Ornate Box Turtle	Reptile
Holbrookia maculata	Lesser Earless Lizard	Reptile
Phrynosoma hernandesi	Greater Short-horned Lizard	Reptile
Sceloporus graciosus	Northern Sagebrush Lizard	Reptile
Sceloporus undulatus elongatus	Northern Plateau Lizard	Reptile
Sceloporous tristichus	Plateau Fence Lizard	Reptile
Sceloporus undulatus erythrocheilus	Red-lipped Prairie Lizard	Reptile
Sceloporus consobrinus	Northern Prairie Lizard	Reptile
Urosaurus ornatus wright	Nortern Tree Lizard	
Plestiodon multivirgatus multivirgatus	Northern Many-lined Skink	Reptile
Plestiodon skiltonianus utahensis	Great Basin Skink	Reptile
Aspidoscelis sexlineata viridis	Prairie Racerunner	Reptile
Charina bottae	Rubber Boa	Reptile

Table A-1. Wildlife species potentially occurring within the proposed corridors.

Scientific Name	Common Name	Type
Coluber taeniatus	Striped Whipsnake	Reptile
Coluber constrictor flaviventris	Eastern Yellowbelly Racer	Reptile
Heterodon nasicus	Plains Hognose Snake	Reptile
Lampropeltis triangulum	Milk Snake	Reptile
Opheodrys vernalis	Smooth Greensnake	Reptile
Pituophis catenifer deserticola	Great Basin Gopher Snake	Reptile
Pituophis catenifer sayi	Bullsnake	Reptile
Storeria occipitomaculata	Redbellied Snake	Reptile
Storeria occipitomaculata pahasapae	Black Hills Redbelly Snake	Reptile
Tantilla nigriceps	Plains Blackhead Snake	Reptile
Thamnophis elegans vagrans	Wandering Garter Snake	Reptile
Thamnophis radix	Plains Garter Snake	Reptile
Thamnophis sirtalis	Common Garter Snake	Reptile
Thamnophis sirtalis fitchi	Valley Garter Snake	Reptile
Thamnophis sirtalis parietalis	Red-side Garter Snake	Reptile
Crotalus oreganus concolor	Midget Faded Rattlesnake	Reptile
Crotalus viridis	Prairie Rattlesnake	Reptile

Appendix B: Big Game Habitat Maps

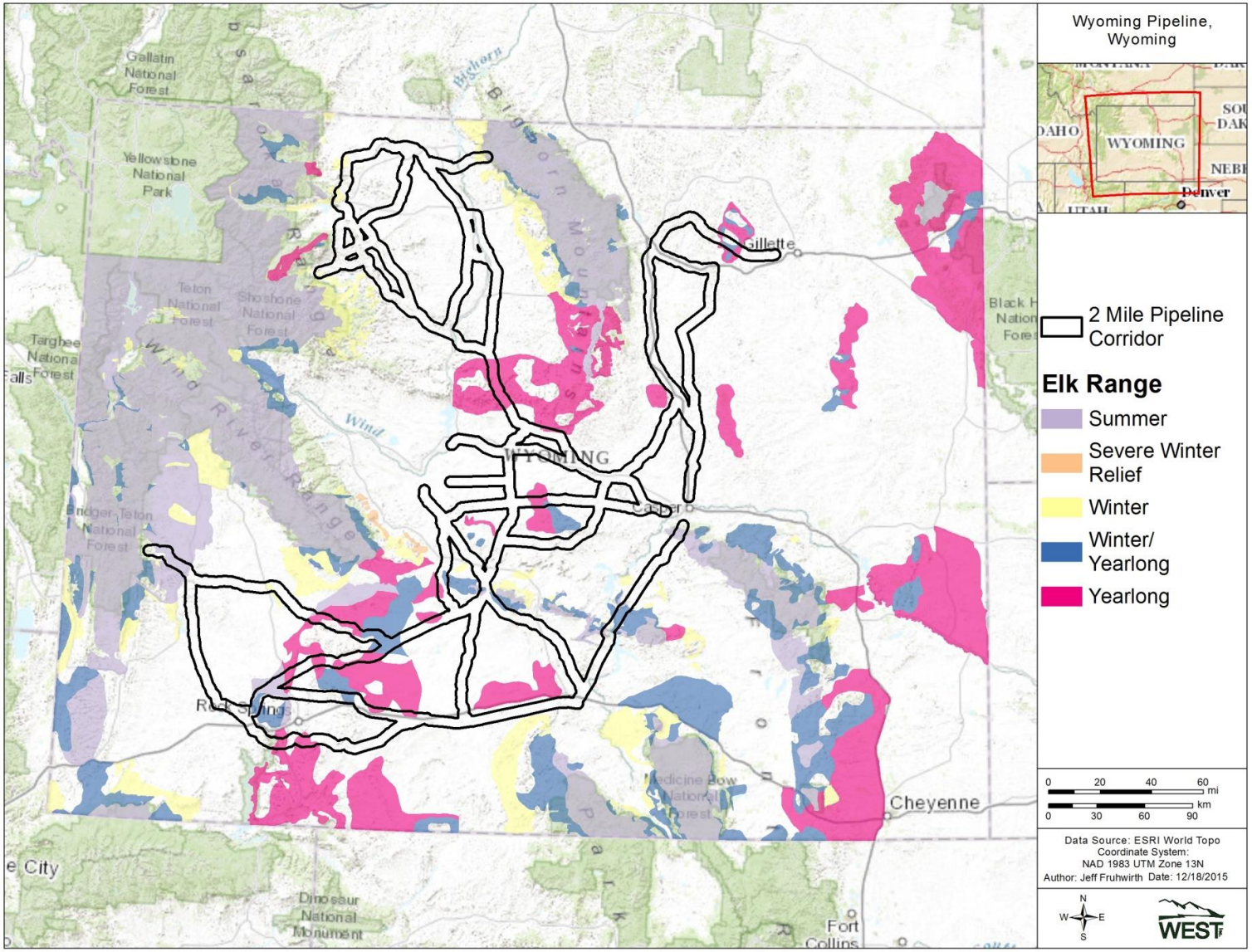

Figure B-1. Elk Seasonal Ranges in Proposed Corridors.

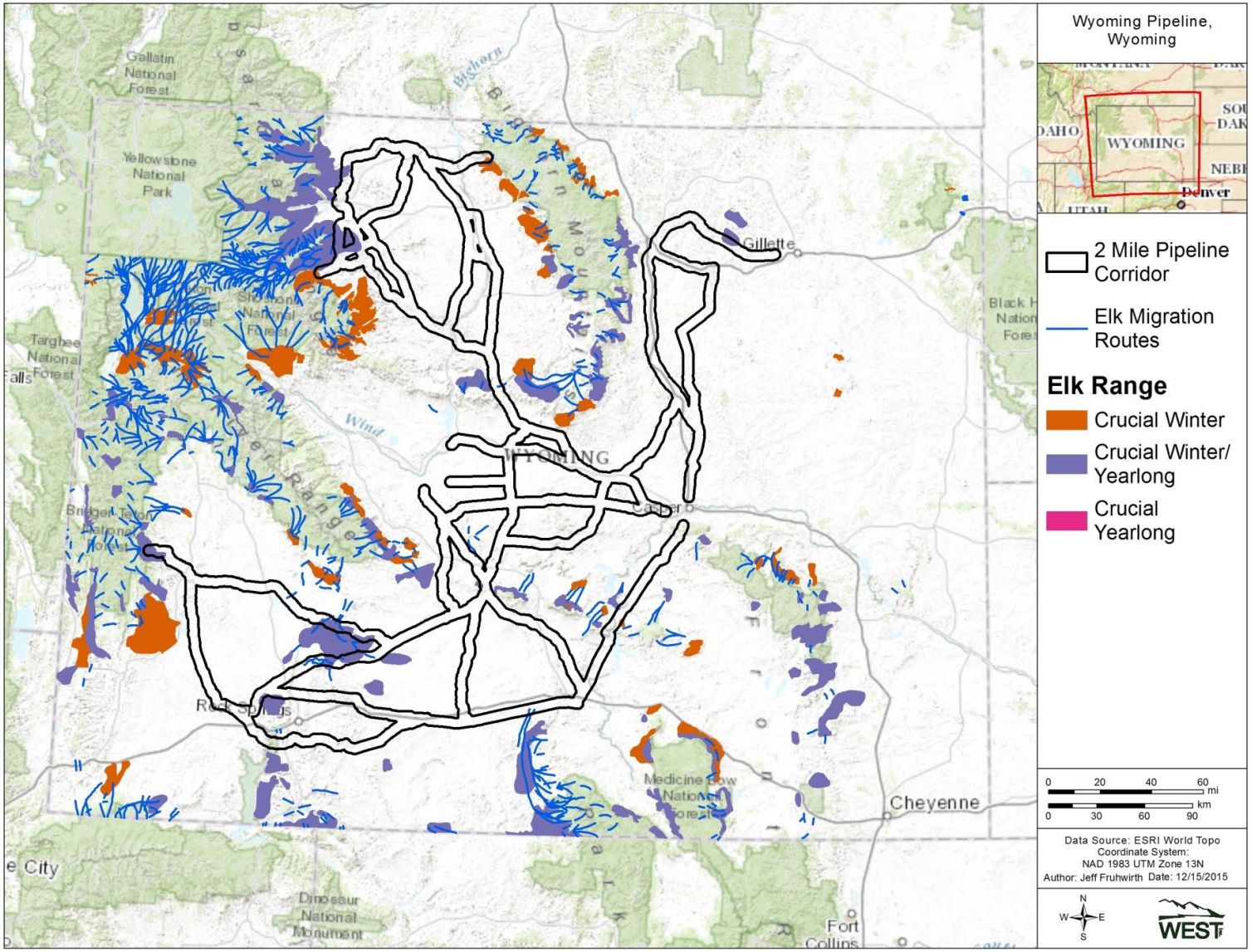

Figure B-2. Elk Seasonal Ranges in Proposed Corridors.

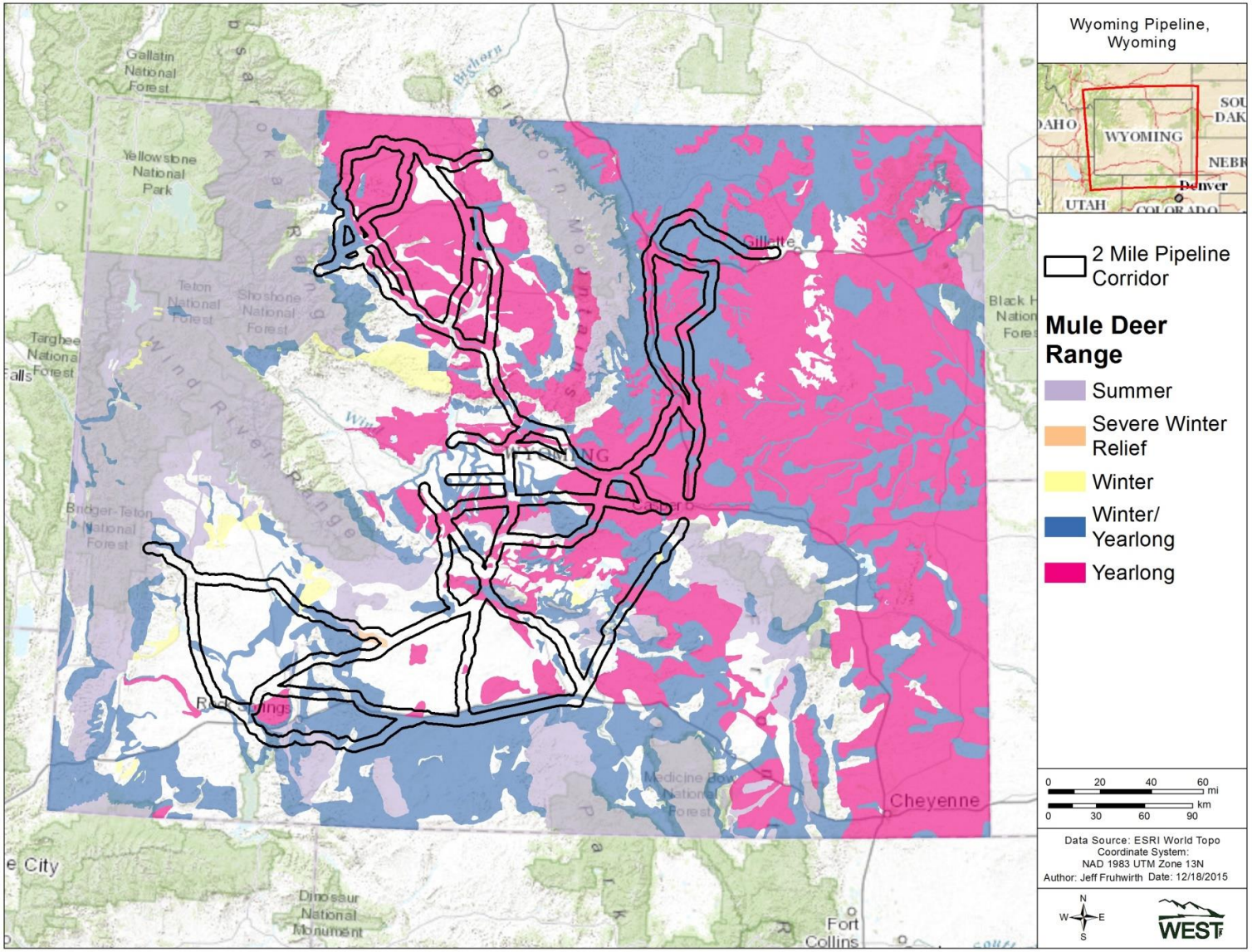

Figure B-3. Mule Deer Seasonal Ranges in Proposed Corridors.

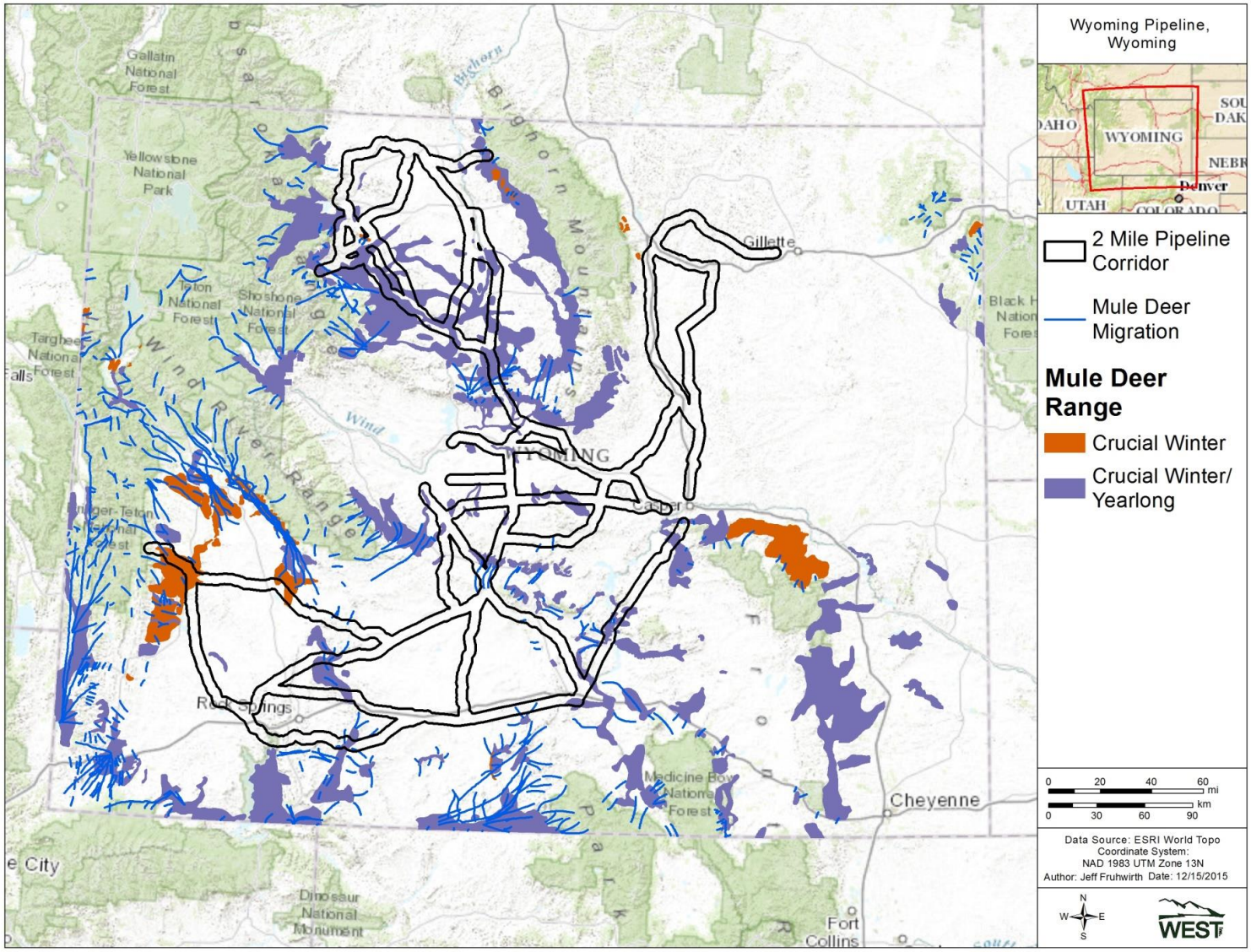

Figure B-4. Mule Deer Crucial Ranges in Proposed Corridors.

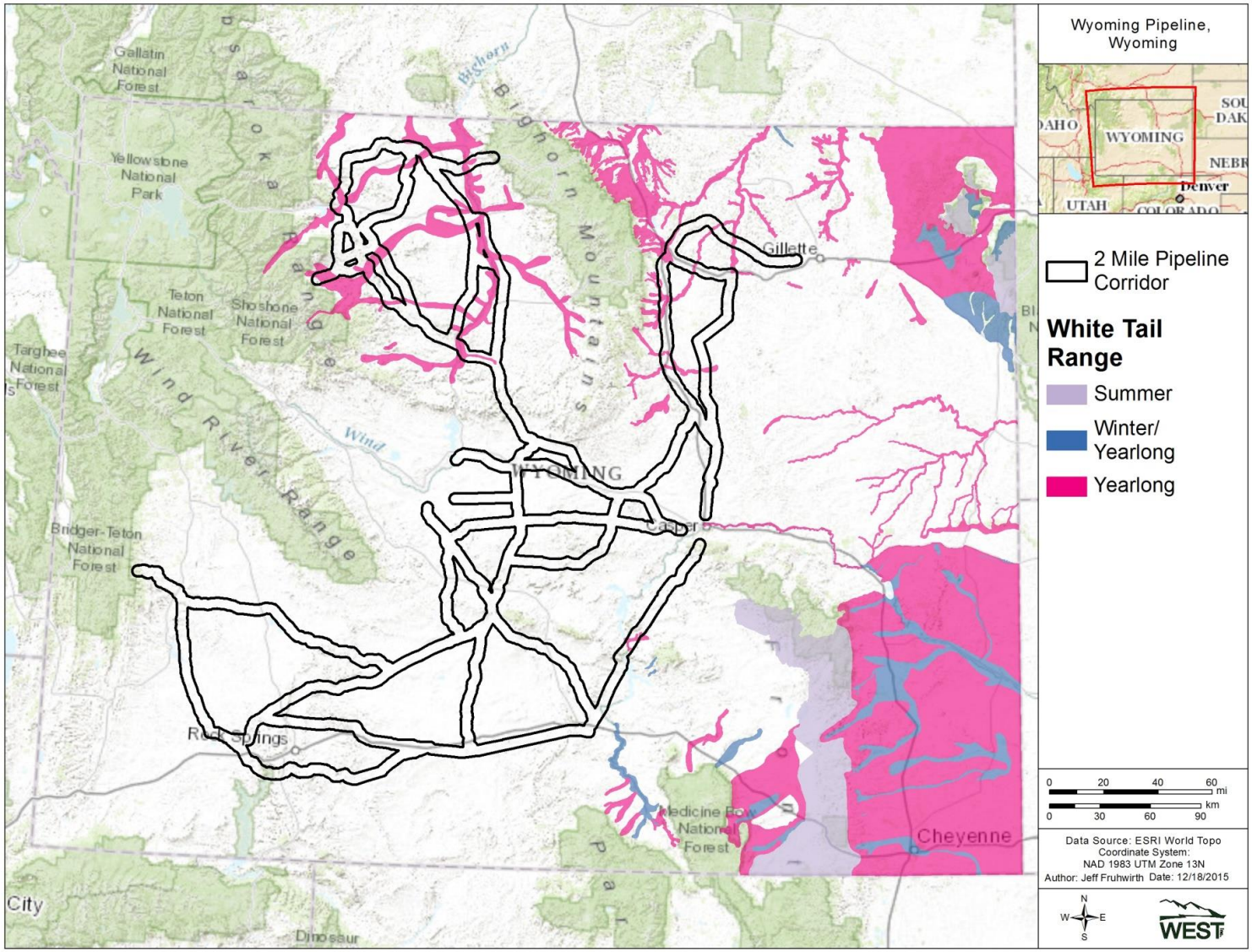

Figure B-5. White Tail Deer Seasonal Ranges in Proposed Corridors.

Figure B-6. Antelope Seasonal Ranges in Proposed Corridors.

Figure B-7. Antelope Crucial Rages in Proposed Corridors.

Figure B-8. Moose Seasonal Ranges in Proposed Corridors.

Figure B-9. Moose Crucial Ranges in Proposed Corridors.

Figure B-10. Big Horn Sheep Seasonal Ranges in Proposed Corridors.

Figure B-11. Big Horn Crucial Ranges in Proposed Corridors.